

# Consumer Guide 2016

# Diabetes

FORCAST®

March/April 2016

The  
Healthy  
Living  
Magazine

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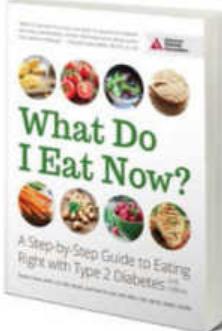
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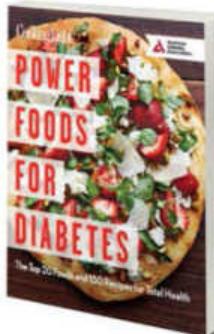
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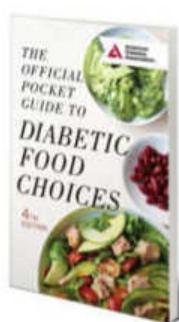
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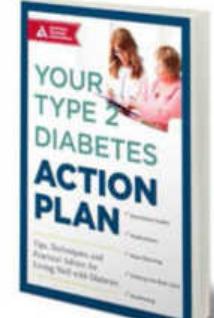
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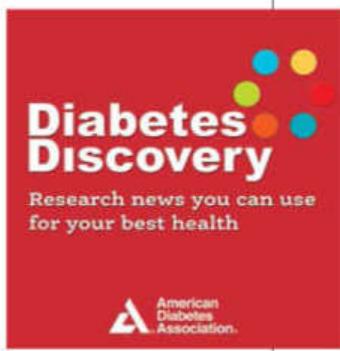
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This month on: [diabetesforecast.org](http://diabetesforecast.org)

### HE SAYS, SHE SAYS

Listen in as a doctor and a person with diabetes chat about new diabetes science. Cohosts **Neil S. Skolnik, MD**, professor of family and consumer medicine at Temple University School of Medicine and associate director of the family medicine residency program at Abington Memorial Hospital, and **Kelly Rawlings, PWD**, editorial director of Diabetes Forecast magazine, discuss highlights from the American Diabetes Association's professional scientific journals. Hear more at [diabetesforecast.org/podcasts](http://diabetesforecast.org/podcasts).



## Reader Guide

All editorial content in *Diabetes Forecast*® is reviewed by health care professionals. The content is for informational purposes only. Seek the direct advice of your own health care provider for any questions or issues you may have regarding your health.

**Recipes** are reviewed according to accepted standards for healthful eating with diabetes. Nutrition needs and therapies vary, however, so please consider your own eating plan, as well as advice from your health care provider, as the ultimate guide on what to eat.

**Research** news may involve products, technologies, and theories that are in the early stages of testing and development. Avoid basing any treatment decisions on such preliminary results.

**Interviews** with people who are affected by diabetes sometimes reflect personal experiences and opinions that may not be consistent with standards of diabetes care. We respectfully offer a platform to showcase the insights, experiences, and diversity of the diabetes community.

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# Welcome

## Top Gear

**THANKS FOR READING** the annual *Diabetes Forecast* Consumer Guide (it begins on p. 41), the most complete and detail-rich listing of diabetes devices on the U.S. market. Although we don't test or rank the products, we do provide product specs that can help you compare the tools. We concentrate on items you can buy now, but we also sneak a peek at a dozen investigational products that you'll want to know about.



Each year, I'm impressed with the meters, insulin pumps, and more that have revolutionized how we take care of ourselves at home, work, school, and wherever else we go. I'm reminded, however, that beyond the battery-operated color touch screens and fancy software, simple solutions can be immensely satisfying when navigating life with diabetes. For me, an elastic hairband has made my frequent finger pricks a little more convenient.

I like to carry my meter, strips, and lancing device in a small, colorful wristlet—a little less boring than your standard meter case. But when I first started using such bags (which don't have the elastic straps that are sewn into most meter cases) I'd have to grope for all those loose items when it was time to check. That would steal my focus from participating in a meeting, deciding what to order from a menu, or, you know, life. Sometimes I found myself about to lance my finger with a lipstick tube.

To the rescue: a stretchy neon green elastic band intended for ponytails. I loop it around my gear so it's all in one bundle. You may have heard the term "life hack." This is one, a simple solution that makes life—and diabetes—just a little easier. I'd love to hear about your diabetes solutions!

Thanks to one little elastic band, I'm spending less time locating my gear and more time living, while still fitting in the blood glucose checks that keep me healthy. More time living? That's what the Consumer Guide is all about.

Fondly,

A handwritten signature in black ink that reads "Kelly".

Kelly Rawlings, PWD\*  
[forecasteditor@diabetes.org](mailto:forecasteditor@diabetes.org)

Twitter: [@KellyRawlings](https://twitter.com/@KellyRawlings)

\*Person with diabetes



**March 22** is American Diabetes Association Alert Day, a wake-up call to take the Type 2 Diabetes Risk Test. By answering simple questions about age, weight, family heritage, and a few other factors, people can learn whether they are at high risk for developing type 2. And then they can learn how to prevent, or at least delay, the serious health condition. The test takes only a minute to complete. Please share this link with the people in your life: [diabetes.org/risktest](http://diabetes.org/risktest).

Get friendly with us at [facebook.com/AmericanDiabetesAssociation](https://facebook.com/AmericanDiabetesAssociation)

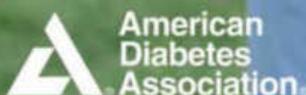
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# Changing Lives

## Through Partnerships



American  
Diabetes  
Association

Changing lives for the better doesn't happen just because people say it should. Change happens when people—and entire organizations—step up and say no to the status quo.

This year, we are proud to highlight our National Strategic Partners who did just that. Their corporate support, while distinctly different, all embrace a consistent theme of changing lives for the better. Through their positive actions, healthy lifestyle messaging and alliance to our cause, these companies demonstrated their commitment to Stop Diabetes by helping us increase awareness about the seriousness of diabetes, raising more dollars to fund research and programs, and advocating that the challenge of diabetes cannot and will not limit the potential of Americans to rise beyond the disease.

To learn more about our National Strategic Partners visit [diabetes.org/nsp](http://diabetes.org/nsp).

2015 National Strategic Partners



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# Ryan Reed: Challenging People On & Off the Track!

Ryan Reed is living life in the fast lane and doesn't let diabetes get in his way. When he was diagnosed with type 1 diabetes at the age of 17, Ryan was told he would never race again. Through hard work and determination, Ryan has realized his dream of becoming a professional race car driver, scoring his first big win in Daytona in 2015.

He's inspiring the nearly 30 million Americans living with diabetes to find the tools they need to live well with diabetes.

Ryan continues his work with the American Diabetes Association® in the Drive to Stop Diabetes™ presented by Lilly Diabetes campaign. He wants you to know there are things you can do today to start feeling better: talking to your doctor, moving more, adopting healthier eating habits, and exploring different diabetes treatments.

**So take the challenge! Empower yourself to actively manage your diabetes.**

Visit: [drivetostopdiabetes.org](http://drivetostopdiabetes.org)



American Diabetes Association.  
**DRIVE TO STOP DIABETES™**

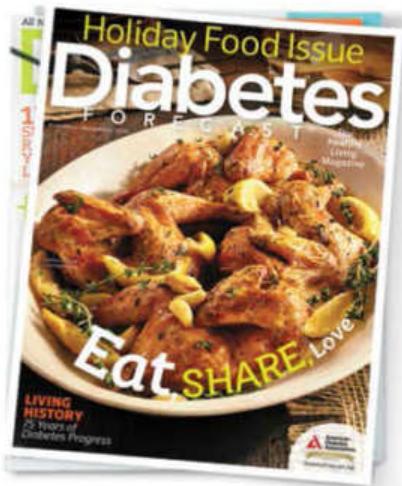
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Ryan Reed's name and/or likeness used by authority of Roush Fenway Racing, LLC.



## Change Is Good

**READING "LIVING HISTORY"** in your November/December 2015 issue [[diabetesforecast.org/timeline](http://diabetesforecast.org/timeline)] brought back many memories of the significant changes in diabetes care. I was diagnosed with diabetes in 1946, at the age of 7. Much later in my life, I learned that my parents were told I might not make it to 12.

In the beginning, I had to boil my thick needles and glass syringes in a porcelain pot on the stove. I used Benedict's solution to check the percentage of sugar in my urine until 1964, when Dextrostix was introduced. My parents' next major purchase was the Ames Glucometer, which was too large to carry around and cost somewhere around \$600. One of the greatest miracles was the introduction of the insulin pump—my first was very large and weighed approximately one pound.

With all of the new technologies, you still have to focus on diet. I've been blessed: My wife believes in proper diets and has been cooking, weighing, and measuring my food since 1962. Because of my wife and the pump, I have lived with diabetes for 69 years and still have my legs, eyes, and kidneys functioning.

**Charles E. Cabibi Jr., Metairie, Louisiana**

**AS SOMEONE WHO'S had diabetes since 1994, the tremendous progress in dealing with every aspect of it is incredible. I lead a very normal life with minimal effort required to manage my well-controlled diabetes. I feel very fortunate and very grateful to the thousands of people and decades of work that have made this possible. Modern science, medicine, and technology are indeed blessings.**

**David Zamarin, Henderson, Nevada**

**I ALWAYS ENJOY your magazine and have done so for many years. I am 66 years old and have been fighting the good fight since the age of 13, when I had to hide in the bathroom in school to test myself and/or take a shot. I worked rotating shifts as a cop for over 30 years, and though I had some problems, I was able to retire. After a few major heart surgeries, I am hanging in there. The continuous glucose monitor (CGM) and insulin pump were the greatest advancements in diabetes. I thank the researchers and companies such as Medtronic for their work.**

**Donald Irvin, Belmont, New Hampshire**

## Step by Step

**THE ARTICLE IN** the September/October issue ["Bench Warmers," [diabetesforecast.org/outdoorexercise](http://diabetesforecast.org/outdoorexercise)] shows a woman using a bench as a step. I think that a better choice of stairs should have been used here. This is a hygiene issue. If I were to sit on a bench, I would hope that the remnants of someone's shoes would not be left over. Two or three stairs would have been a much more fitting graphic to have been used.

**Beth Woolford, Seattle**

## Back to Basics

**MY WIFE HAS** Alzheimer's disease, and I am the sole caregiver for her. I have never



## Food Focus

**I GOBBLED UP** this issue from beginning to end. I found "A Bug's Life" [Nov./Dec. '15, [diabetesforecast.org/microbiome](http://diabetesforecast.org/microbiome)] to be fascinating. Truly our food system needs healing. I would urge the American Diabetes Association to not only fund medical research (millions) but to support food systems in the United States that will provide access to healthy foods.

**Name Withheld**

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We are not able to publish all letters and reserve the right to edit them. Although we will honor requests for anonymity, all letters to *Diabetes Forecast* must include your full name, city, and state.

## Reply All

learned to cook—we live alone, and she cannot teach me. She no longer can cook, so we live on easy meals, such as frozen dinners, pizza, Corn Flakes, a lot of fruit, and salad. All of your articles assume that one knows the basics of cooking. I don't, and my attempts have all but poisoned us. Please give me some tips on what to buy so I can control my blood sugar. Any hints and suggestions are more than just welcome—they will be life saving!

**Alan Masson, Sun City West, Arizona**

**The Editors Respond:** Healthy eating is an important part of diabetes management, as you know. But most people aren't gourmet chefs—and that's OK. You can learn the basics of cooking, which will help you create meals with blood glucose control in mind. The American Diabetes Association publishes some cookbooks (all available at [shopdiabetes.org](http://shopdiabetes.org)) that can get you started: [Secrets of Healthy Cooking: A Guide to Simplifying the Art of Heart Healthy and Diabetic Cooking](#) by Barbara Seelig-Brown will walk you through some healthy-eating techniques and skills. If that still feels a bit too advanced, check out Nancy Hughes's [Two-Step Diabetes Cookbook](#) and [The 4-Ingredient Diabetes Cookbook: Simple, Quick, and Delicious Recipes Using Just Four Ingredients or Less](#), both of which feature easy, fast meals that don't require much skill. Or visit the ADA's [Quick Meal Ideas page](#) ([diabetes.org/quickmealideas](http://diabetes.org/quickmealideas)) to see a list of healthy foods, meal ideas, and recipes.

### Going Low

I ENJOYED READING these hypo stories ["Readers' Hypoglycemia Stories," [diabetesforecast.org/goinglow](http://diabetesforecast.org/goinglow)]. I have been battling the curse for 36 years. I can't put into words the fear and panic during these episodes. They don't happen as often now that I'm on the pump. This is one of the best devices to come out of the electronics revolution. I still get hypoglycemia fairly regularly, but I don't go so low anymore. It's time to push stem cell research as hard as possible and cure this terrible disease.

**David Ludgate, Richmond, Virginia**

### ASK THE EXPERTS

#### Lesser of Two Evils

Why is low blood glucose worse than high blood glucose?



**Linda A. DiMeglio, MD, MPH, responds:** Both high and low blood glucose come with their own risks. Neither is necessarily worse than the other.

**What to Know:** Hypoglycemia happens when the body's glucose level dips too low. Symptoms of mild hypoglycemia include shakiness, sweatiness, hunger, lightheadedness, dizziness, headache, and mood swings. Severe hypoglycemia can be associated with short-term complications, including loss of consciousness, seizures, and (rarely) death. While you can treat mild hypoglycemia with rapid-acting carbohydrate (glucose tablets or juice are top options), more severe lows may require outside help, such as with injectable glucagon or intravenous glucose.

When too much glucose builds up in the blood, hyperglycemia occurs. In the short term, high blood glucose can cause fatigue, blurry vision, and dehydration. When combined with inadequate insulin, hyperglycemia can also be associated with diabetic ketoacidosis (DKA), a medical emergency requiring hospitalization, intravenous fluids, and insulin. DKA is characterized by shortness of breath, abdominal pain, vomiting, and dehydration. If left untreated, the condition leads to changes in mental status and, eventually, death.

Sustained high blood glucose over many years is associated with long-term complications of diabetes, including kidney damage, nerve damage, and eye disease.

**Find Out More:** With low blood glucose, the risks are generally more immediate, while chronic high blood glucose can cause harm over time. You will need to work with your provider to figure out the best target blood glucose ranges for you. You can get more information on low blood glucose at [diabetes.org/hypoglycemia](http://diabetes.org/hypoglycemia) and on high blood glucose at [diabetes.org/hyperglycemia](http://diabetes.org/hyperglycemia).

**Takeaway:** Check your blood glucose as often as your doctor says is right for you—and more often if you have symptoms of low or high blood glucose, your activities vary from normal, or you are ill. Get your A1C checked regularly at your doctor's office. By paying attention to both low and high blood glucoses you can increase the likelihood that you will stay safe, today and over many years with diabetes.



Grilled Salmon Tacos with Avocado Cabbage Carrot Slaw

## ONE SIZE DOES NOT FIT ALL WHEN IT COMES TO DIET & DIABETES.

According to the American Diabetes Association, there is no one diet or meal plan that works for everyone with diabetes. The important thing is to follow a meal plan that is tailored to personal preferences and lifestyle and helps achieve goals for blood glucose, cholesterol levels, blood pressure, and weight management.

When choosing carbohydrates, favor naturally occurring carbohydrates, such as those found in whole grains, beans and peas, vegetables, and fruits, especially those high in dietary fiber, while limiting refined grains and intake of foods with added sugars.

**Diets rich in foods containing fiber, such as some vegetable and fruits, may reduce the risk of heart disease, obesity and type 2 diabetes.**

Take a look at research published in *Nutrition Journal* about the effects of eating half of a fresh avocado at lunch. To read the full study and get recipes and other avocado nutrition facts, visit [loveonetoday.com/ada15](http://loveonetoday.com/ada15) or in Spanish [saboreaunohoy.com/ada15](http://saboreaunohoy.com/ada15).

In honor of the 75th anniversary of the American Diabetes Association, the Hass avocado industry is proud to be the first whole food national supporter of the Stop Diabetes® movement. Activities leading up to Hispanic Heritage Month and beyond are focused on a joint goal to help increase Hispanic awareness about the benefits of good fats and fiber as a key part of daily nutrition. Already Hispanics in the U.S. are nearly twice as likely to get diabetes as non-Hispanics. The campaign will step up conversations nationwide about the benefits of eating good fats like fresh avocados.



### FAST FACTS ABOUT AVOCADOS

Per 2-3 slices of avocado (1 serving)

Calories	50
Total Carbohydrates	3 grams
Dietary Fiber	2 grams (8% of daily recommended value)
Total Sugar	<1 gram (least amount of sugar per serving of any other fresh fruit!)



Aguacates frescos—Saborea Uno Hoy!® se enorgullece de apoyar la campaña Alto a la Diabetes.



# Discovery

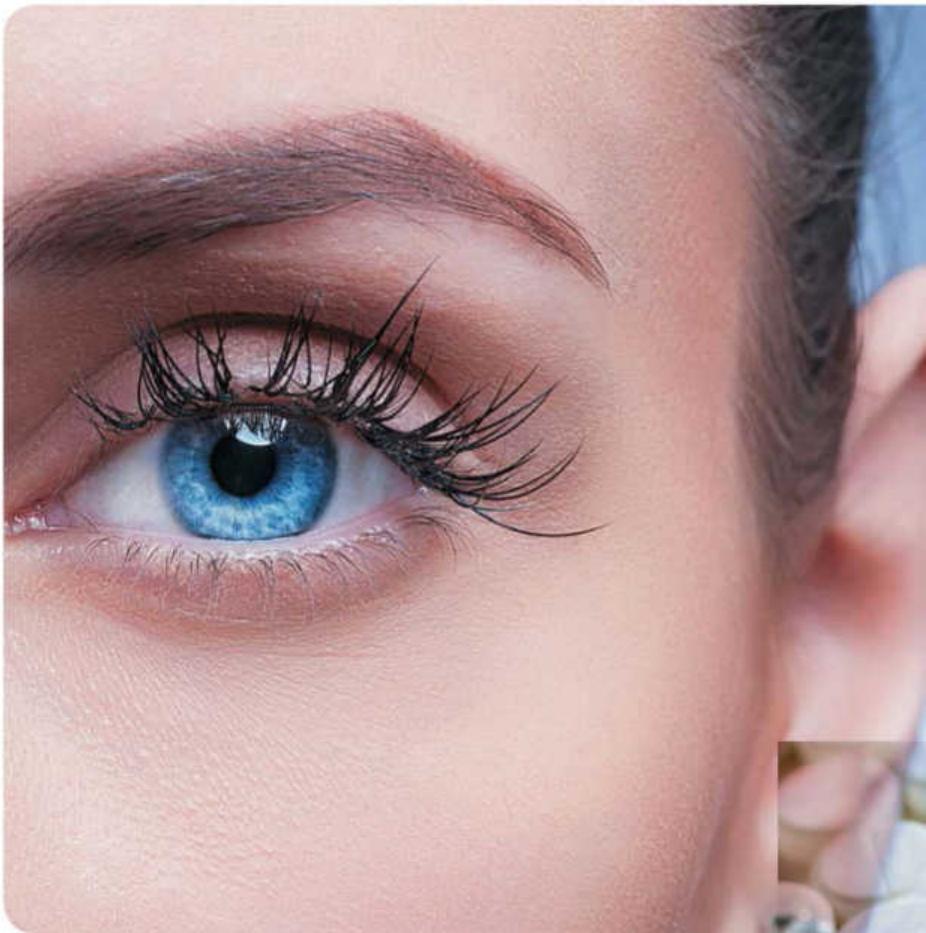
By Miriam E.Tucker

## The Eyes Have It

An alternative therapy for diabetes-related eye disease (diabetic retinopathy) may end up replacing lasers as the go-to treatment. Called ranibizumab, it is injected into the eye, where it blocks the growth of weak blood vessels, which can break and impair vision. In a study, 394 eyes of 305 patients with severe proliferative retinopathy were randomly assigned to either one to three laser treatments or ranibizumab injections once monthly for three months.

At the end of the two-year study, participants who had ranibizumab injections were more accurately able to read an eye chart and had better peripheral (side view) vision than those who received laser treatment. Only 4 percent of people who received ranibizumab injections required a vitrectomy, an eye operation to clear blood or remove scar tissue. The surgery was necessary for 15 percent of participants in the laser group. However, researchers caution that long-term effects of ranibizumab aren't known yet.

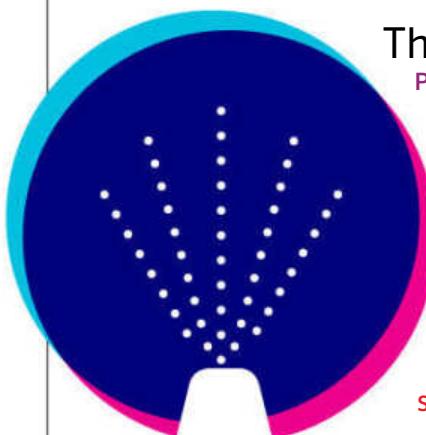
**SOURCE:** *The Journal of the American Medical Association*, published online Nov. 13, 2015



## The Nose KNOWS

People with diabetes who take insulin or drugs called sulfonylureas can experience low blood glucose (hypoglycemia). Most of the time, people can treat themselves by eating or drinking something sugary. But if the episode is severe and the individual can't self-treat, a glucose-raising hormone called glucagon can be given by someone else. Currently glucagon is only available in a kit and must be mixed with a liquid solution and given by injection. But researchers are studying an experimental intranasal version. In a study of 75 adults with type 1 diabetes who were given insulin to lower their blood glucose, both the intranasal formulation and the injections raised glucose levels to 70 mg/dl or greater within 30 minutes. (For more on the intranasal glucagon used in the study, flip to p. 43.)

**SOURCE:** *Diabetes Care*, published online Dec. 17, 2015



Kharichkina/Thinkstock (eye)



# diabetes

## Hard to Chew



● Good dental care is extremely important for people with diabetes. New nationwide data on dental health among 37,609 adults ages 25 and older from 1971 through 2012 show that while tooth loss is declining overall, it remains higher among people with diabetes. By 2012, the average number of missing teeth was 6.6 for those with diabetes, compared with 3.4 for those without. The proportion of people who had at least 21 of their original teeth was 87 percent for those without diabetes but just 69 percent among those with diabetes. African Americans were at greater risk than whites for tooth loss, while Mexican Americans had a lower risk.

**SOURCE:** Preventing Chronic Disease, published online Dec. 3, 2015



### Drug Downer

The type 2 diabetes drug metformin may not benefit adolescents with type 1 diabetes. Researchers added either daily metformin or a placebo to the insulin regimens of 140 overweight or obese teenagers with poorly controlled type 1 diabetes. Both groups started off with an average

A1C—a measure of long-term glucose control—of 8.8 percent. After 13 weeks, participants' A1C had a slightly greater drop with metformin, but by the 26-week mark, both groups had the same average A1C level: 8.6 percent.

The teens on metformin dropped their insulin doses by about 21 percent compared with their peers who took the placebo. And while the placebo group's weight rose by 4 pounds, metformin users didn't gain weight. They experienced more gastrointestinal problems, however.

**SOURCE:** The Journal of the American Medical Association, published online Dec. 1, 2015

gawriloff/Thinkstock (toothbrush)  
BananaStock/Thinkstock (pills)

**Shop to Stop Diabetes® at amazon smile**  
You shop. Amazon gives.

Amazon will  
donate 0.5% of  
your purchases  
back to the  
American  
Diabetes  
Association®.

**Get Started Now at**  
**smile.amazon.com**





Discovery

# nutrition



## TV Targeting

While shifting away from child-directed television advertising, companies are increasingly aiming ads for unhealthy children's foods at their parents. In a study of 342 ads promoting 51 different foods or drinks for kids, nearly half were targeted at parents. Researchers were particularly concerned about ads for sugar-sweetened fruit juices and chocolate-flavored milk, for which parent-directed ads accounted for 60 and 100 percent of the air time, respectively. Unlike ads aimed at kids, which focus on fun or taste, those that addressed parents often featured health messages such as "no high-fructose corn syrup" or "now with 35 percent less sugar," which could lead parents to believe these products are good for children when they're not.

**SOURCE:** *Pediatrics*, published online Nov. 9, 2015

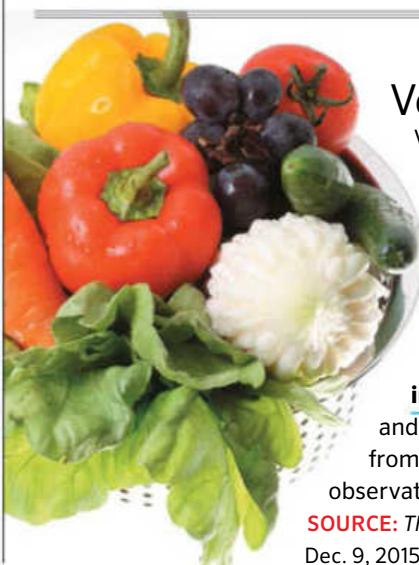
## EATING TO IMPRESS?

Guys, pay attention: You may be eating more when you dine with a woman.

Researchers observed and surveyed 105 adults dining at an all-you-can-eat buffet with at least one other person. Men dining with women ate 93 percent more pizza (about three versus 1½ slices) and nearly three times more salad than those eating with other men.

Interestingly, the women ate the same amount of pizza and salad regardless of their lunch companions.

**SOURCE:** *Evolutionary Psychological Science*, published online Nov. 10, 2015



## Vegged Out

Vegetarian diets are healthful, so vegetarians must be healthier than meat eaters, right? Perhaps not. Researchers combined results from two diet trials involving a total of 60,310 people, 30 percent of whom ate meat an average of five times a week and 34 percent of whom were vegetarians (of those, 4 percent were vegans and ate no animal products, including milk or cheese). During the two- to three-year study periods, there were no differences

in total numbers of deaths by diet group. But vegetarians and vegans were about half as likely as meat eaters to die from certain cancers, including pancreatic cancer. This observational study doesn't prove cause and effect, however.

**SOURCE:** *The American Journal of Clinical Nutrition*, published online Dec. 9, 2015

## PEOPLE HELPING PEOPLE

Next time you're looking for exercise inspiration, post your intention on social media. It might help you stick to the plan. Researchers offered 217 graduate students 13 weeks of in-person exercise classes, such as yoga, muscle building, and spinning, given throughout each week. One group simply took part in the classes. Another group attended the classes but also received online messages encouraging physical activity. A third participated in the classes as well as an online network of four to six anonymous fellow participants who could follow each other's progress (but not interact).

**Participants in the network signed up for more classes total and also reported exercising more than those in the other groups.**

**SOURCE:** Preventive Medicine Reports, published online Aug. 13, 2015



## Time Outside

For children in day care, time spent outside translates to more activity—and that can lead to better health. In a study of 388 preschoolers at 30 randomly selected day care centers in Ohio, researchers observing on a single day found that, despite the majority of centers claiming to provide kids with twice-daily outdoor time, only 40 percent of the kids had two or more sessions, and 32 percent had no outdoor time at all. **The children who were able to spend at least 60 minutes outdoors averaged an additional 10 to 14 minutes of moderate to vigorous physical activity, compared with kids who didn't spend an hour outside.** That, combined with indoor activity, could help them meet the recommended 60 minutes per day, researchers say.

**SOURCE:** American Journal of Preventive Medicine, published online Nov. 12, 2015

## DON'T JUST SIT THERE

If your day involves a lot of sitting still, get up and get walking. Even standing for just five minutes every half hour could help your body better control blood glucose.

Researchers studied 22 overweight postmenopausal women with prediabetes. One group sat still for 7½ hours. The other two groups interrupted sitting every half hour by either standing up or walking on a treadmill for five minutes.

**Compared with sitting still, walking lowered post-meal blood glucose levels by 34 percent, while simply standing lowered those levels by 28 percent.**

What's more, those who had interrupted their sitting by standing or walking still had lower post-meal blood glucose levels the next day.

**SOURCE:** Diabetes Care, published online Dec. 1, 2015



## Kids and Cholesterol

About one in five American kids ages 6 to 19 had at least one abnormal cholesterol measurement during 2011–2014, raising the risk for later heart disease. **In all, 21 percent of children in a large nationwide survey had high total cholesterol, high LDL (“bad”) cholesterol, or low HDL (“good”) cholesterol.** The risk increased with age, from 14 percent of children ages 6 to 8 to 27 percent of teens ages 16 to 19. Weight also played a part: 43 percent of obese children had at least one abnormal cholesterol reading versus 14 percent of their normal-weight peers. It's important to make sure your child's doctor is checking your child's cholesterol and other heart disease risk factors—and discussing the results with you.

**SOURCE:** National Center for Health Statistics Data Brief, published online Dec. 10, 2015



## Kids' Best Friend?

Having a pet dog in the house may not make children more active or help with weight loss, but could reduce their anxiety. During routine doctor visits, researchers surveyed parents of 370 children ages 4 to 10 with a dog and 273 same-age kids without. They found no differences in body mass index (BMI, a ratio of weight to height), physical activity levels, or screen time. But, **even after accounting for family income, the kids with dogs had significantly lower scores on a measure of anxiety:** Just 12 percent scored a level of concern compared with 21 percent of those without dogs. Researchers believe that interacting with dogs could help children form emotional bonds or raise feel-good hormone levels.

**SOURCE:** *Preventing Chronic Disease*, published online Nov. 25, 2015

## BEYOND BACTERIA

In recent years, professional guidelines have advised doctors to be more cautious than they have been in the past about prescribing antibiotics because the bacteria that the drugs fight become resistant. Now, **researchers have found another problem with antibiotic use in kids: extra weight gain.** They studied nearly 150,000 kids ages 3 to 18, accounting for factors that can affect kids' weight. Those with at least one antibiotic prescription in the past year and at least seven in their lifetime had gained an average of 3 pounds more by age 15 than did kids who never took antibiotics. It's not clear why there's a connection between antibiotics and weight, but researchers think it might relate to the drugs' effect on the balance between “good” and “bad” bacteria in the gut that help people process nutrients and calories. But keep in mind: The study doesn't prove antibiotics directly cause weight gain.

**SOURCE:** *International Journal of Obesity*, published online Oct. 21, 2015



## Around the Middle

Carrying around a big belly could be more deadly than being generally overweight or obese, new research shows.

Of the 15,184 adults studied for an average of 14 years, 40 percent were normal weight, 35 percent were overweight, and 25 percent were obese. In all, 70 percent had “central obesity,” as defined by a high waist-to-hip ratio.

**Individuals who were at a normal weight for their height but had central obesity had about double the death rate during the study of those of a similar weight without the big belly.**

The risk was slightly higher for men than women. As expected, a combination of overall and central obesity raised the death risk even higher.

**SOURCE:** *Annals of Internal Medicine*, published online Nov. 9, 2015

IPG Gutenberglberg UK Ltd./Thinkstock (man); klenova/Thinkstock (vegetables)

## Fat Chances

● Low-fat diets may not be the best way to lose weight, suggests an analysis of 53 published trials involving 68,128 participants. The studies all compared low-fat diets with other types of diets, including low carb and those containing higher amounts of fat. Weight loss or maintenance was the goal for 40 of the studies, while the others were investigating outcomes such as cancer and heart disease. In the weight-loss trials, low-carbohydrate diets produced better weight loss than did low-fat ones, by about 2½ pounds. **Low-fat diets didn't reduce weight more than higher-fat diets and only led to greater weight loss when compared with groups of people given no particular dietary instructions.** Still, the best diet for you? A healthy one you can stick with to meet and maintain your weight and other health goals.

**SOURCE:** *The Lancet*, published online Oct. 30, 2015



## APP LACK

For losing weight, an app alone is unlikely to get you to goal. Researchers randomly assigned 365 overweight or obese adults ages 18 to 35 to one of three interventions: One group received a smartphone app and another got the app plus personal coaching. Both were designed using research-based principles of behavior management, motivation, targeted goal-setting, healthful eating, and regular exercise. The third (control) group was simply given handouts on lifestyle change.

**After six months, the personal coaching group had lost nearly 7 pounds compared with 2½ pounds for the control group and just under 2 pounds for those who used the app alone. But there were no significant differences among the groups at the end of the two-year study.** The bottom line: Some apps might still help with weight loss, but only in combination with other approaches.

**SOURCE:** *Obesity*, published online Nov. 4, 2015

# IT STARTS WITH YOU.



## TAKE CHARGE, INSPIRE OTHERS AND TEAM UP!

Now is the time to make a difference and raise money to find a cure. Whether you have diabetes, or a friend, coworker or family member does – diabetes must be cured. Create a team and take the lead. You have the power to raise dollars that will spark the next big research discovery on our way to a cure. Every dollar is a step closer to a cure.



American Diabetes Association.

**STEP OUT** | **WALK**  
TO STOP DIABETES®

[stepout.diabetes.org](http://stepout.diabetes.org)



#StepOutDiabetes

# Power Moves

Find your strength with a muscle-friendly workout | By Kirsten C. Ward, MS, RCEP, CDE



**I**t's good to be strong. And it's even better to know that you can always improve your strength through training. That's important because people begin losing muscle mass at age 30. By age 70, you'll have lost approximately 25 percent of the muscle mass you had at age 30. The only way to prevent age-related muscle wasting (sarcopenia) is to use your muscles.

Avoiding loss of your muscle mass will make everyday actions—such as walking up stairs, getting up from the floor, and standing up from a seated position—easier and more comfortable to do. In fact, when you feel stiff, are overweight, or have joint problems, strength training is especially important.

**MYTH: Strength training decreases flexibility.**

► **FACT:** Increasing your muscle mass and strength will not reduce flexibility. Sometimes when starting a strength-training program, people become aware of decreased range of motion. This is most likely due to prior inactivity. If you're obese, extra adipose tissue may be the cause of your decreased range of motion. Doing resistance exercises can help improve that.

**MYTH: If I have arthritis, I can't exercise.**

► **FACT:** Strength training helps support the joints affected by arthritis. Being consistent with your workout can increase muscle strength and decrease the load on the joints, which can cut down on pain and inflammation. Performing isometric exercises (more on those later) can help build strength when there is inflammation.

**MYTH: Faster is better.**

► **FACT:** Form and control are more important than speed. It's OK to move quickly and in rapid succession through strength moves, but never compromise form and always control the movement. Your "fast" may be slower than someone else's, and that's fine. Go at your own pace.

The following group of exercises features three strength training principles—isometric, super slow, and power training. **Isometric exercise** includes staying in a static position. The joint angle and muscle length do not change. **Super-slow strength training** uses very slow speeds of lifting and lowering, usually 10 seconds of lifting and 10 seconds of lowering.

**Power training** is a combination of both strength and speed, and it's incredibly useful for everyday life. Imagine you see

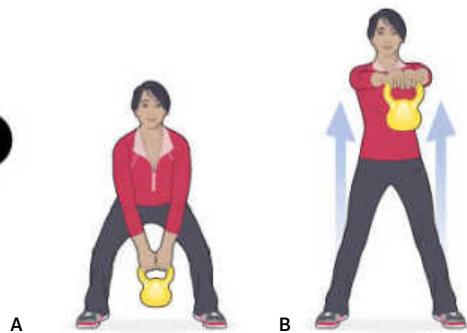
an elderly woman crossing the road at an intersection and she is not able to cross before the light changes. She may have the strength to cross the street, but not the power to cross in the allotted time. As we age, power is lost more quickly than strength. One way to retain or gain power is to increase the speed during the exercise.

## Safety Note

Talk to your doctor before making any big changes to your exercise plan.

**Supplies you'll need for these moves:** handheld weights, such as a kettlebell, dumbbells, heavy book, or plastic bottles of water.

1



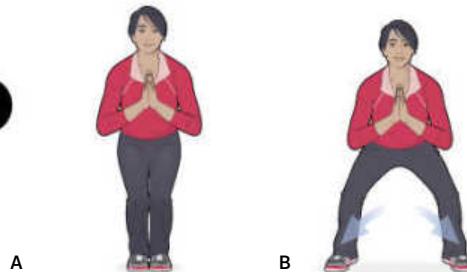
### KETTLEBELL SWINGS

**Strengthens thighs, buttocks, abdomen, and upper arms**

A Use a kettlebell, a dumbbell, or other heavy object (aim for something that weighs 5 to 15 pounds, depending on your strength). Start in a squat position with the kettlebell between your legs. Keep your chin up; do not look down at the floor. Tighten your abdominal muscles. B Rise up from the squat to standing, extending your arms and lifting the kettlebell to shoulder height. Return to the squat position and repeat.

**REPETITIONS:** 10–15

2



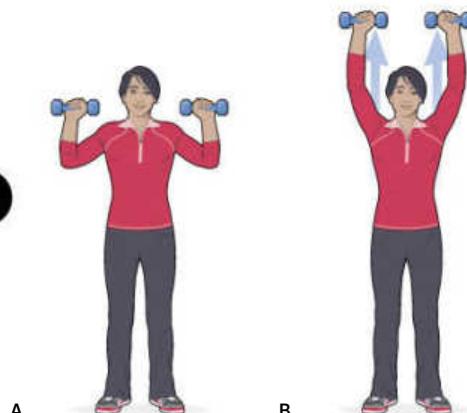
### SQUAT JACKS

**Strengthens thighs, buttocks, and abdomen**

A Start in a squat position with your feet together, your elbows bent, and your palms touching in front of your chest. Keep your chin up and tighten your abdominal muscles. B Jump your feet out into a wide squat and then jump them back together. Repeat. Stay in a squat and keep your back flat during the entire exercise.

**REPETITIONS:** 10–15

3



### OVERHEAD PRESS

**Strengthens shoulders, arms, and chest**

A Using hand weights (5 to 25 pounds, depending on your strength), start with your elbows bent out to the sides with the weights at about shoulder height. Tighten your abdominal muscles and keep your knees slightly bent. B Lift the hand weights overhead in a super slow motion to a count of 10, then slowly lower them to starting position to a count of 10. Repeat.

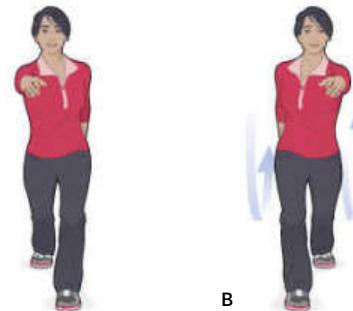
**REPETITIONS:** 10–15

## PLYOMETRIC LUNGE

### Strengthens thighs, buttocks, and abdomen

A Start in a lunge position with one leg bent at the knee in front of you and the opposite arm directed forward. Your other leg and opposite arm should extend behind. Lunge as low to the ground as you comfortably can, leaning forward slightly with your spine straight. B Quickly, with a little hop, switch your back leg and arm into a forward lunge position. Repeat.

**REPETITIONS:** 10–15



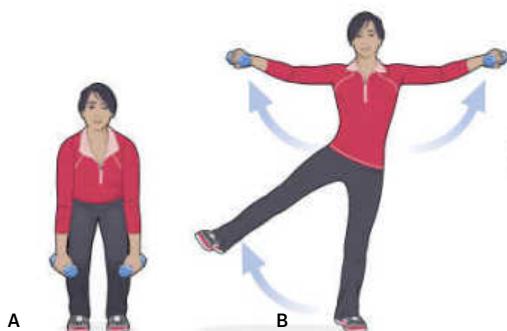
4

## SQUAT WITH OUTER LEG RAISE

### Strengthens inner and outer thighs, buttocks, abdomen, and shoulders

A Start in a squat position with your feet hip width apart and your arms at your sides. If desired, hold hand weights. Tighten your abdominal muscles. B Stand up, raising your right leg out to the side while standing on the left leg. As you do so, raise your arms to form a T. Return to the squat position and repeat with your left leg.

**REPETITIONS:** 15 per leg



5

## PLIÉ SQUAT

### Strengthens thighs, buttocks, and abdomen

Assume a squat position with your feet widely spaced and your knees turned out toward your big toes (your knees should not face forward or buckle inward). Press your palms together at chest height, tighten your abdominal muscles, and keep your spine straight.

**REPETITIONS:** Hold the position for 30 seconds, working up to 2 minutes.



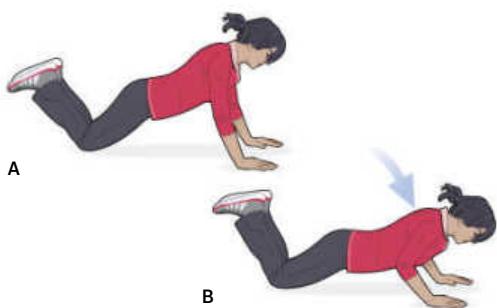
6

## POWER PUSH-UP

### Strengthens shoulders, upper arms, and core

A Start with your knees on the floor, your heels raised. Support your torso on your extended arms, with your palms shoulder width apart. Tighten your abdominal muscles. B Bend your elbows out to the side and lower your chest to the floor slowly, to a count of 10, keeping your spine straight. Push up quickly and repeat.

**REPETITIONS:** 10



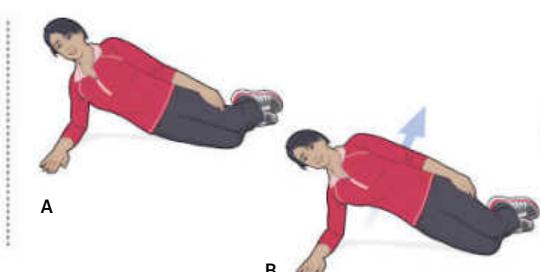
7

## SIDE PLANK

### Strengthens hips and abdomen

A Lay on your right side, knees bent at 90 degrees with your legs behind you. Rise up onto your right forearm. B Lift your hips off the floor, keeping your abdominal muscles engaged. Support your body on your knee and forearm. Hold as directed, below. Switch to the other side and repeat.

**REPETITIONS:** Hold this position for 30 seconds, working up to 2 minutes per side.



8

**Kirsten C. Ward, MS, RCEP, CDE,** is an exercise physiologist, certified diabetes educator, and certified health coach. She has traveled nationally and internationally, presenting on diabetes and physical activity, and enjoys practicing what she preaches by running, hiking, and doing yoga. Find her at [healthcoachboston.com](http://healthcoachboston.com).



# Health-Boosting Ideas for Organizations

## WELLNESS on WHEELS

Many organizations have comprehensive health and wellness programs for their employees and members. One dilemma some face is reaching employees who are constantly on the move while performing their jobs. Two companies that have been designated Health Champions by the American Diabetes Association are meeting the challenge head on by taking to the streets to ensure their workforces are able to reap the rewards of participation.



The **San Francisco Municipal Transportation Agency (SFMTA)** employs more than 4,800 people and has employees working 24/7 all over San Francisco. Its innovative fitness and wellness program “Road to Fitness” features “Health Strong,” a mobile health and wellness unit that brings services, exercise equipment, and wellness staff to employees at remote locations.

Dallas, Texas-based **Rogers-O’Brien Construction** is tackling the problem of reaching employees who move job sites often, have limited computer access and language barriers. They conduct biometric screenings on job sites and offices through finger stick tests to provide immediate health education onsite. Laptops are provided at events to support assessment completion in both English and Spanish.

*If your organization is boosting health and wellness in an innovative way, let us know at [healthchampion@diabetes.org](mailto:healthchampion@diabetes.org).*



# Congratulations, Health Champions!

Take a look at the impressive list of organizations that have met the criteria to become Health Champion Designees. Does your organization have what it takes? Learn more at [wellnessliveshere.org](http://wellnessliveshere.org).

## Corporate Elite

Antea Group  
Atlanta Southern Corporation  
Baxter International, Inc.  
Birdsong Corporation  
Canon ITS  
Centura Health  
Chesapeake Regional Health Care  
Cinemark USA, Inc.  
City of Suffolk, VA  
CLARK Material Handling Company  
CNIC Health Solutions, Inc.  
Cobb Electric Membership Corporation  
Conwed Plastics  
Diabetes Management & Supplies  
Eli Lilly & Co  
Florida Hospital  
Gateway Bank of Southwest Florida  
General Dynamics Information Technology  
Greystone Healthcare Management  
Halliburton Company  
Health Partners Plans, Inc.  
HealthSouth Corporation  
Horizon Blue Cross Blue Shield of New Jersey  
Hy-Vee  
Independence Blue Cross  
Infirmary Health  
The Kroger Co.  
LifeStart Wellness Network  
McCormick & Company, Inc.  
Medline Industries, Inc.  
Methodist Health System  
MissionPoint Health Partners  
Monroe Plan for Medical Care  
Nature's Products Inc.  
Nelnet, Inc.  
Nestle Health Science-Pamlab, Inc.  
Norfolk Southern Corporation  
Novo Nordisk Inc.  
Nutrisystem, Inc.  
Pacific Medical Centers  
Pentair  
Personalized Prevention  
Prime Therapeutics  
Quest Diagnostics  
RealTruck.com, Inc.  
Regional Transportation District (Denver)  
Riverside Health System  
Rochester Regional Health  
St. Mary Mercy Hospital  
St. Petersburg College  
Saul Ewing LLP  
Scott & White Memorial Hospital  
Seneca Gaming Corporation  
Staples, Inc.  
The Starr Group

Toshiba Business Solutions, Inc.  
University of Iowa  
University of Pennsylvania  
Upstate Medical University  
Verizon  
Walgreens Area 67  
Wallace Welch & Willingham  
Weiser Memorial Hospital  
Womack Machine Supply Co.

## Organization Elite

American Diabetes Association  
American Diabetes Association—Greater San Diego Area  
American Diabetes Association Los Angeles  
American Diabetes Association of North Texas  
The American Society of Anesthesiologists  
Midland YMCA

## Corporate

Aon  
Arkansas Children's Hospital  
Arkansas Heart Hospital  
Ball State University  
Beaumont Health  
Becton Dickinson (BD)  
Black Hills Exploration and Production  
Bon Secours Virginia Health System  
Boston Scientific  
CareFusion Headquarters  
Christiana Care Health System  
Clay Township Regional Waste District (IN)  
CoBiz Financial  
Conway Regional Health System  
Corpus Christi Independent School District (TX)  
Delaware Division Public Health  
Drexel University  
Einstein Healthcare Network  
Excellus BCBS  
Farm Bureau Financial Services  
Grange Insurance  
GreenPath, Inc.  
Greenwich Hospital  
Halvor Lines Trucking Inc.  
Hasbro, Inc.  
Holland & Hart LLP  
ITT Corporation, Gould's Pumps Inc.  
Klickitat Valley Health  
Lacks Enterprises, Inc.  
Lutheran Services in Iowa  
Manpower Group  
Marsh & McLennan Agency  
McLeod County, MN  
MillerCoors—Bill Coors Wellness Center  
Monroe Community College  
MVP Health Care

## Navient

Nestlé Purina PetCare  
Nestlé USA  
Northern Navajo Medical Center  
Phalcon, Ltd.  
Phoebe Putney Health System  
Pinnacol Assurance  
Prime Inc.  
ProCare Physical Therapy & Fitness  
Quest Diagnostics  
Quicken Loans Inc., and Family of Companies  
Roger's-O'Brien Construction  
Safeway, Inc.  
San Francisco Municipal Transportation Agency (SFMTA)  
Sentara Center for Health and Fitness  
Shumaker, Loop & Kendrick, LLP  
Sodexo  
SpartanNash  
SilverStone Group  
Spyder Trap, Inc.  
St. Johns Healthcare  
Stronghold Engineering, Inc.  
Sun Life Financial  
Texas Medical Liability Trust  
Thomas Jefferson University and Hospitals  
Tufts Health Plan  
Univera Healthcare  
University of Nebraska—Lincoln  
WaferTech  
Walgreens  
WellDyne, Inc.  
WoodmenLife  
Yale New Haven Hospital

## Organization

The Children's Hospital of Philadelphia  
City of Eustis, FL  
El Camino Hospital  
Erskine Academy  
Grand Prairie Independent School District (TX)  
Michael & Susan Dell Foundation  
Pasco County School District (FL)  
St. Louis County (MN)  
State College of Florida  
YMCA of Austin  
YMCA of Greater Brandywine

## Community

Academy School District (CO)  
Bridgeport Hospital (CT)  
City of Springfield, MA  
Northwest Arkansas Mercy Family YMCA  
Southwest Key Programs  
Town of Normal, IL

[wellnessliveshere.org](http://wellnessliveshere.org)

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# Renal Rules

Your guide to understanding and preventing kidney disease

| By Allison Tsai

## The Pathway to Problems

Uncontrolled blood glucose damages the small blood vessels in the kidneys, says Ian de Boer, MD, MS, associate professor of medicine in the Division of Nephrology at the University of Washington and an investigator at the Kidney Research Institute. "High glucose levels in the blood have a direct effect on kidney cells, leading to damage, inflammation, and scarring that leads to kidney disease."

As the blood glucose increases, the entrance to the kidneys' filtering units dilates, allowing more blood to enter. The downside: At the same time, the "exit vessel" constricts. "Therefore, the pressure goes up [in the kidneys] and you have initial hyperfiltration," says Michael Flessner, MD, PhD, program director in the Division of Kidney, Urologic, and Hematologic Diseases at the National Institute of Diabetes and Digestive and Kidney Diseases. "But then that damages the filtration units and ultimately causes destruction of those units." Damaged kidneys are less and less able to rid the body of waste and may eventually fail. For that, dialysis or a kidney transplant are the only treatments.

## Facts:

- "High blood pressure can damage the kidneys and can lead to more rapid loss of kidney function," says de Boer. That's why it's absolutely critical people with kidney damage maintain strict blood pressure control.
- People with diabetes and advanced kidney disease can't use metformin because of the risk of lactic acidosis, a buildup of lactic acid in the bloodstream.

# 38.4%

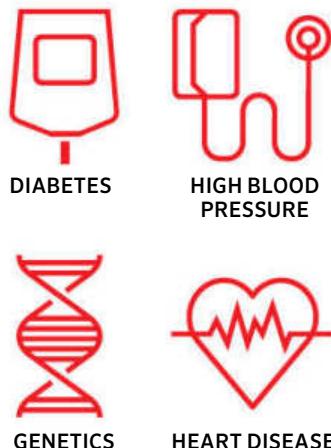
Percentage of U.S. kidney failure cases attributed to diabetes\*



## SKY-HIGH PRESSURE

High blood pressure is a kidney disease risk factor—and part of a dangerous cycle.

### RISK FACTORS



# 20 TO 40%

Percentage of people with diabetes who develop kidney disease

\*American Kidney Fund

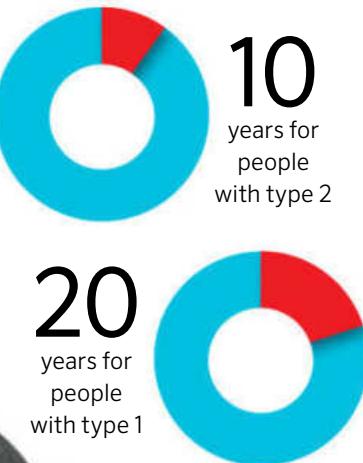
**“The kidneys are highly vascular organs, and 20 percent of each heartbeat’s worth of blood goes to the kidneys.”**

—IAN DE BOER, MD, MS

## SYMPTOMS

Most people with moderate to severe kidney disease don’t experience any symptoms.

### How long does it take on average for kidney disease to progress to failure?



Early detection and treatment of kidney disease can slow the progression.

“African Americans with diabetes have a 2.5 to 5.6 times higher risk for kidney disease than whites.”

—AMERICAN KIDNEY FUND

Ask about this at your next doctor visit.

## SCREENING

Screenings are like spotlights that can illuminate early signs of disease so it can be treated. Important kidney health tests:

- **Urinary Albumin Test**
- **Estimated Glomerular Filtration Rate Test**

According to the American Diabetes Association’s 2016 Standards of Care, here’s how often you should have both of these tests done:

- **Type 1**  
After five years of diabetes, test yearly.  
With high blood pressure, test yearly, regardless of how long you’ve had diabetes.
- **Type 2**  
At diagnosis and every year after

## HOW CAN I PROTECT MY KIDNEYS?

- 1 Control blood glucose to near normal levels.
- 2 Keep blood pressure at or under 140/90 mmHg.
- 3 Stop smoking—it can interfere with your blood pressure medications.\*\*

## I HAVE EVIDENCE OF DIABETIC KIDNEY DISEASE. NOW WHAT?

Your health care provider may:

- 1 Give you strict blood pressure targets.
- 2 Ask you to alter your protein intake.
- 3 Prescribe medications that can help slow the progression of kidney disease such as ACE inhibitors or angiotensin II receptor blockers (but not both).

## KIDNEY FAILURE?

**Dialysis or a kidney transplant is necessary.**

# Tiny Doubles

American Girl's new Diabetes Care Kit accessory for dolls | By Allison Tsai

**L**ots of kids like toys that resemble them. But 13-year-old Anja Busse wanted something more than skin deep. She wanted a doll that had a blood glucose meter and medical ID, just like her. Her wish was granted on January 1, when American Girl released its Diabetes Care Kit.

It's the latest addition to American Girl's Truly Me doll line, for which kids pick their doll's hair color and style, eye color, skin color, and unique accessories—including the diabetes kit. **The \$24 accessory includes a blood glucose meter, lancing device, insulin pump, insulin pen, medical bracelet, glucose tablets, logbook, ID cards, stickers, and a carrying case.**

Each American Girl product takes approximately 18 to 24 months to go from the brainstorming and research stage to the design phase and eventually development. That time frame is especially important for specialized items that require a good deal of research, like the Diabetes Care Kit.

For the kit, American Girl worked with a panel of doctors, nurses, dietitians, and other specialists from the American Family Children's Hospital in Madison, Wisconsin, to make sure the product was accurate and age appropriate. The development hit close to home for the product designer, Matt Wahmhoff, who has type 1 diabetes. "He was able to bring his own personal experience with diabetes to the development process," American Girl's Julie Parks says.

American Girl's attention to detail on the kit paid off. "It is very accurate," Busse says. "They did an amazing job with it."



American Girl launches its Diabetes Care Kit for dolls.

Chung Lee



# FreeStyle

## Precision Neo

Blood Glucose Monitoring System



# Accuracy meets affordability



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# The Insulin Boom

WHY THE COST OF THIS LIFESAVER DRUG IS REACHING NEW HEIGHTS

By Allison Tsai • Illustrations by Steve McCracken

**T**WO MEN AND \$3 changed the course of diabetes treatment. In 1921, Canadian scientists Frederick Banting and Charles Best discovered insulin—a development that altered the outlook for people living with diabetes. Because this discovery could save lives, Banting, Best, and James Collip, their colleague who purified the insulin, sold the patent to the University of Toronto for \$1 Canadian each, with the hope that affordable insulin would become available quickly.

The scientists made it clear that their motivation was for the good of humanity rather than commercial profit. But in order to keep up with demand and produce insulin on a large scale, the University of Toronto signed nonexclusive licenses with medical companies such as Eli Lilly, which went on to produce enough insulin for all of North America by 1923—a move that opened the doorway to the privatization and commercialization of insulin.

In 2014, almost 93 years after the scientists' gesture of goodwill, insulin was a \$24 billion global industry—and it's expanding fast. According to a report from P&S Market Research, by 2020 the global insulin market will top \$48 billion.

Unfortunately, the cost to consumers is also rising, particularly for those who are uninsured or underinsured and those who need large total daily doses. While it's easy to point blame at pharmaceutical companies for increasing prices, certain information about manufacturing costs and health insurance plan discounts is confidential, which makes it difficult to say how prescription drugs are priced.

And drug company profits aren't a bad thing. A portion of that money goes back into research and development to innovate and create better insulin products for the future. But the question remains: What good are these new products if the people who need them can't afford them?





## The Prescription Drug Game

The cost of a vial of insulin starts with the pharmaceutical company and how it sets a price for insulin or any other drug. Algorithms and formulas, along with basic business decisions, inform this price. “Much of how we set price is based on the clinical benefit combined with our—and payers’—understanding about how diabetes can be effectively managed to reduce long-term complications and additional costs those complications place on the health care system,” says Ken Inchausti, a spokesman for Novo Nordisk.

But remember, this is a for-profit industry: Companies might increase the price, for instance, if sales are lower than expected, a competitor will be coming on the market soon, or the patent on a drug is expiring. Or, they may price to match or undercut a competitor to win more market share.

The pharmaceutical company’s set price, called the average wholesale price, is not the price that anyone will theoretically pay, says Irl Hirsch, MD, professor of medicine in the Division of Metabolism, Endocrinology, and Nutrition at the University of Washington. “It’s similar to when you buy a car,” he says. “You go see a car [that] costs \$30,000, but everybody, including the dealer and the person looking at the car, knows that nobody is going to pay that much money—there [are] going to be negotiations.”

Eli Lilly spokesman Greg Kueterman agrees. “Importantly, the list price—typically the center of the price discussion—is not what manufacturers receive,” he says. “Rather, it is a starting point for negotiations.” Negotiations are confidential and occur between the

pharmaceutical companies and middlemen. The results influence how much someone will pay at the pharmacy.

According to Avalere, a business and health care policy analyst firm, these middlemen include drug wholesalers and distributors, pharmacy benefit managers, health plans, and sometimes large retail pharmacy chains, which all negotiate price discounts, often pitting competing pharmaceutical companies against one another to get lower prices. During this process, the middlemen also take a cut of the profit from the negotiations, so they may mark up the drug or may not pass along deep price cuts to their customers.

Pharmacy benefit managers often work on behalf of commercial and government-run health plans to negotiate drug prices, though there are regulations for Medicaid and Veterans Administration plans to ensure that prices can’t rise above a certain level. Pharmacy benefit managers conduct comparative drug research and develop formularies—tiered lists of prescription drugs covered by a health plan. This is where pharmacy benefit managers have quite a bit of negotiating power. If they’ve determined that several insulin products have the same efficacy and side effect profile, then they look at the cost to the plan. Insulin that costs the plan the least will land on a lower tier on the formulary—and have a cheaper copay.

Copay is key with drug manufacturers, who know patients are more likely to buy drugs that cost them less. So they’ll offer pharmacy benefit managers big discounts to make their drug more

attractive. They may offer an additional discount to better position their drug against competitors—so their drug ends up on a lower tier while their competitor's is on a higher tier with higher copays.

### Cash and Rebate Flow

To make matters more confusing, discounts are not given up front. For instance, if you pay a \$35 copay at the pharmacy, the pharmacy will bill your health plan to recoup the rest of the cost. All of these negotiations are confidential, so we don't know the discounts and prices agreed upon within this process.

See the flow of insulin, payments, and rebates among the parties involved, at right.

### In the Shadows

When it comes to insulin, some brands, including Humulin R, Levemir, and Lantus, have increased in wholesale price by more than 160 percent in the past five years, according to a 2015 Bloomberg Health report. It started with a price hike for Lantus, followed by a similar increase for Levemir, and so on—a practice called shadow pricing.

While this increase is alarming, it's less so for people with insurance: With the negotiated discounts and rebates, the wholesale price isn't the cost an insured person will pay. (For instance, the price Lilly received for Humalog after all negotiations rose by only 4 percent between 2009 and 2014, Kueterman says.) But depending on your plan, these increases may still have an effect. "Over the last few years, many people have moved from traditional copay insurance plans, where they paid predictable copay prices for prescription medicine, to high-deductible or coinsurance plans,

leading to higher and unpredictable list prices for extended periods of time," says Kueterman. In the Affordable Care Act's state health insurance marketplace, Hirsch says, many people purchase plans with high deductibles—up to \$6,000—that don't cover drugs. While they pay a low premium every month, they'll have to pay the full price on insulin until they reach that \$6,000 benchmark to receive medicine benefit coverage from the plan. In some plans, medication is not subject to a deductible, so do your research before you buy.

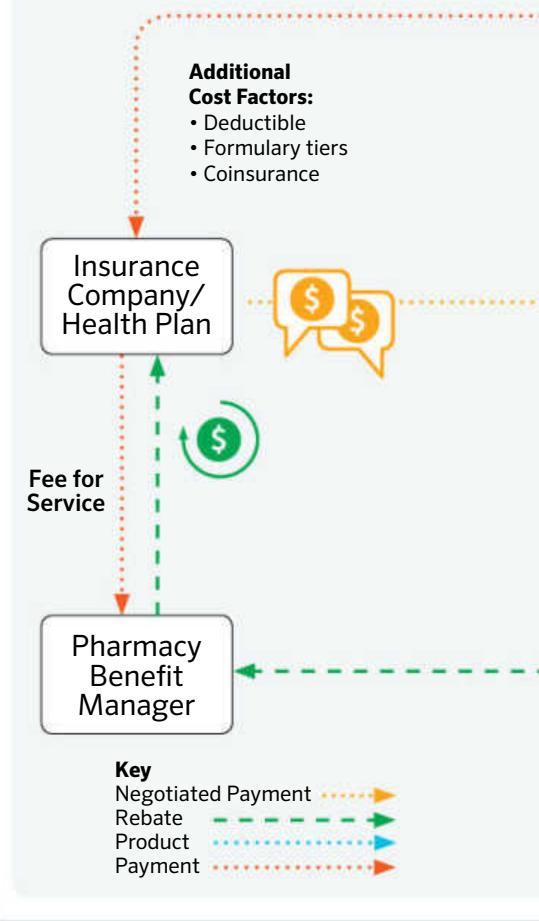
It's also possible that copays or coinsurance percentages are rising to meet the increased cost of these drugs. Endocrinologist Kasia Lipska, MD, MSH, assistant professor of medicine at the Yale School of Medicine, has numbers to back that up. In her 2014 *Journal of the American Medical Association* study on the use and out-of-pocket costs of insulin for people with type 2 diabetes, she found that among the commercially insured population that her team analyzed, out-of-pocket costs for insulin increased by 89 percent from 2000 to 2010.

"I see a lot of patients in my clinical practice who cannot afford the insulin they are taking," she says. "I have to work with them and discuss the financial implications of using one versus the other, because it really matters. Sometimes it's between taking the insulin and paying their bills."

### Analog Versus Human

Lipska was surprised by some of her findings: "Human insulin has become almost entirely obsolete in private clinical practice," she says. That's partially because analogs—such as NovoLog, Humalog, and Lantus—are made to more closely mimic how the body secretes insulin. "They can be used in more

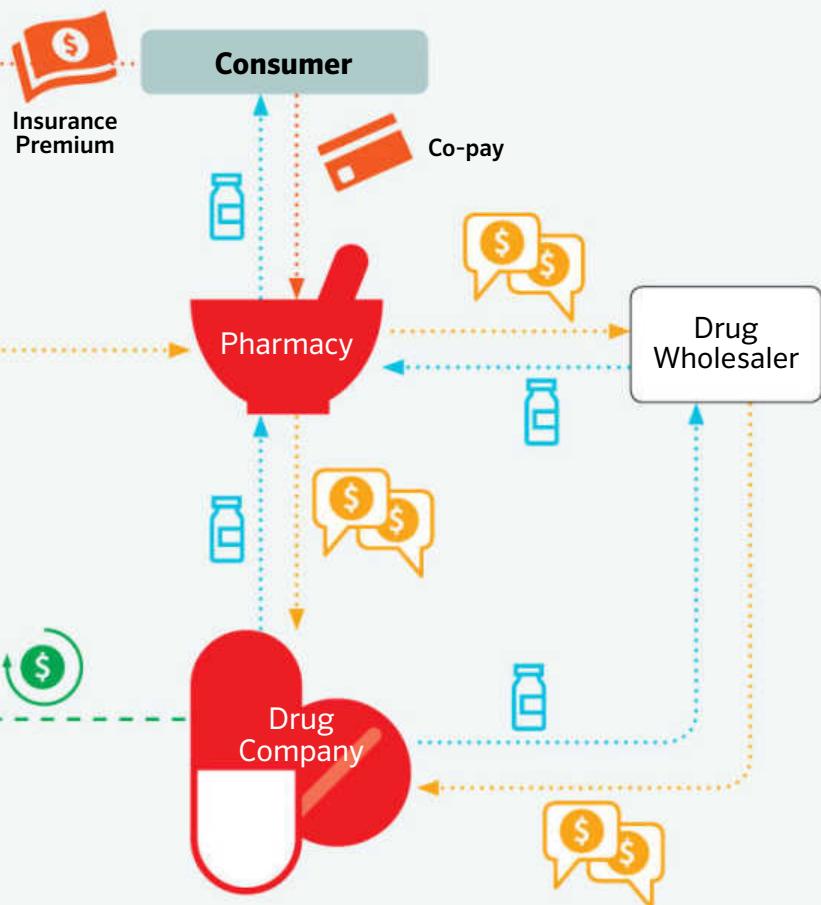
## The Insulin-Payment Journey



flexible ways," Lipska says.

Because of faster action, rapid-acting analogs can be dosed close to the start of meals instead of 30 minutes before.

But, in terms of evidence, Lipska says the benefits of analogs for people on basic insulin therapy are not as clear-cut. "We know that, in people with type 2, the long-acting insulin analogs may be associated with a little bit less hypoglycemia at night, but otherwise, when you compare head-to-head in terms of analog versus human insulin, there aren't big differences in terms of glycemic [blood glucose] control or the safety of these different preparations," she says. In addition,



Hirsch says the long-acting analogs have not shown improvements in hypoglycemia for people with type 2 the way they have for people with type 1.

Once you weigh that evidence, consider cost. Insulin analogs are often seven to eight times more expensive than human insulins, says Lipska. That's especially costly for people who take large doses of analog insulin daily.

The short-term solution: If you're on basic insulin therapy, discuss with your doctor the possibility of switching to less expensive human insulin.

Cost drove Geralyn McGrath, 53, of Tucson, Arizona, to switch

from Lantus, an analog, to Humulin 70/30, a mix of two types of human insulin. Lantus cost her \$190 with insurance. McGrath, who was diagnosed with type 2 a year ago, kept up with the costs for about six months before asking her doctor to switch her to human insulin. "I told my doctor, 'I just can't do it anymore. It's just strapping us,'" she says. "I couldn't have anything extra in my life."

Now she pays \$126 for her insulin. It's better, but the cost still puts a strain on her family's finances. "We manage to survive, but we shouldn't have to pay so much for something we need to live," she says.

**THE GOOD NEWS?** McGrath says her blood glucose control is about the same on human insulin as it was on analog. The only downside is convenience. "I liked that I had to [take Lantus] once a day," rather than at mealtimes throughout the day, she says.

**YOU SHOULD KNOW:** If you decide to pay \$25 out of pocket for human insulin at Walmart rather than go through your insurance, you may run into problems, especially if you have type 1. Your insurance may believe you're not on insulin anymore because you're not getting it through them. "So now the insurance won't pay for strips, won't pay for continuous glucose monitors, [and] won't pay for pump supplies," Hirsch says. The solution: Ask your pharmacist to run the insulin through the online billing system for the insurer with a \$0 charge so your supplies are still covered.

## Skyrocketing Prices

Government programs typically get some of the lowest-available prices for prescription medications—but they've been paying more for insulin, too. In a 2015 *JAMA Internal Medicine* article on trends in Medicaid reimbursements for insulin, Jing Luo, MD, a research fellow in the Division of Pharmacoepidemiology and Pharmacoeconomics at Boston's Brigham and Women's Hospital, found that no matter how he cut up the data, insulin of all types was increasing in price.

Luo and his team discovered that between 1991 and 2014, the amount of money Medicaid paid pharmacies per unit of insulin increased by between \$6.86 and \$15.38, depending on insulin type. And they found that the rate of increase was higher for insulin with patent protection. (What the study didn't determine, though, was whether the rebates

pharmaceutical companies send Medicaid offset the price hikes.)

Overall, Luo says these increasing prices likely have an effect on government-run programs such as Medicaid and Medicare Part D and, in turn, the people who use their services. For instance, programs may try to contain costs by implementing prior authorization for medications, which means your plan will review your situation and requested medications before it agrees to cover the drug.

### The Donut Hole

Drug cost is a major issue for people using Medicare prescription drug coverage, which is available only through private insurers. In most plans, there is a coverage gap, also known as "the donut hole." Once you've spent a certain amount of money on covered drugs, plus your deductible, you enter the donut hole, where you pay a larger percentage of the price of each drug until you

spend another benchmark amount of money and get out of the donut hole. When you're in the donut hole, the price of the drug really matters because you pay a percentage of that to fill your prescription.

In 2016, once you and your plan have spent \$3,310 on covered drugs, you're in the donut hole. At this point, you will be responsible for 45 percent of the price of brand-name drugs and 58 percent of the price of generic drugs.

So how do you get out of the donut hole? Spend money on brand-name prescriptions. For those, your 45 percent and the 50 percent manufacturer discount both apply toward reaching that next

benchmark. For generic drugs, only what you pay applies. Once you hit \$4,850 in 2016, you will be out of the donut hole. At that point, you'll have what's called catastrophic coverage, and you have to pay only a small coinsurance or copay for covered drugs for the rest of the year.

**GOOD NEWS:** The donut hole will be closing in 2020, at which time people on Medicare will pay one price throughout the year.

### Brace for Impact

"Type 2 diabetes is a condition that impacts minorities and lower socioeconomic people more," says Hirsch. And they're the ones who are suffering the most with the rising costs. To make ends meet, some people are engaging in risky behaviors, such as rationing insulin. This can lead to sustained hyperglycemia and, in severe cases, diabetic ketoacidosis.

It's also common for people to skip refills on prescriptions they can't afford. "Some patients might not tell their doctor they're having difficulty paying for the medicine," Lipska says. "They might just not fill it, and that would be the worst outcome."

In the type 1 population, Hirsch says some people are stretching

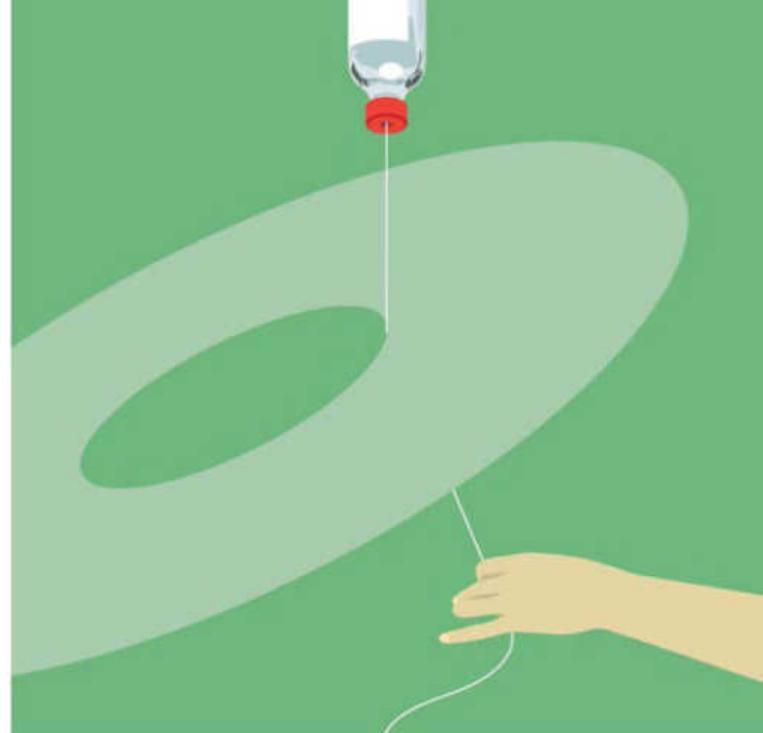
## Pricing Solutions

According to the American Diabetes Association, insulin is a unique medication: When it is needed, there are no alternative therapies to preserve health and life. The Association supports high-quality diabetes therapies that are available and affordable for all people with diabetes, noting that people in need of lifesaving medication should never go without due to prohibitive costs or accessibility issues.

Numerous public policy and private sector solutions are emerging on how to make this a reality. The Association supports several promising avenues for change, including:

- Wanting to see all off-patent diabetes medications, including insulin, in the lowest cost-sharing tier on all formularies
- Supporting the authorization of the Centers for Medicare and Medicaid Services (CMS) to negotiate prices for prescription drugs under Medicare Part D
- Supporting the move toward value-based benefit design from the current fee-for-service system to incentivize better outcomes, in addition to promoting adherence to recommended therapy to reduce emergency department visits and hospitalizations.

Urging transparency in pricing policies by all parties involved in the numerous steps that it takes for medications to travel from the manufacturer to the consumer, the Association also strongly encourages continued dialogue across the diabetes marketplace, in public policy and in the private sector, to develop lasting, affordable solutions.



Click

## More Online

Head to

[diabetesforecast.org/insulinchart](http://diabetesforecast.org/insulinchart)

for a list of current insulins on the market, their characteristics, how they're delivered, and more.

their insulin by severely limiting carb intake or just letting their blood glucose run high, which can lead to a host of complications. Pharmaceutical patient assistance programs, which offer discounts to qualifying consumers, can be useful in such situations.

Price issues show up in other ways, too, even for people with insurance. Hirsch says a patient of his forgot her insulin one day when she was an hour away from home. She went to the pharmacy to pick up another vial, and it cost her \$250: the full price of the insulin.

For people who have made the switch back to cheaper human insulin from more expensive analogs, there are still worries. "My biggest concern is that the companies are going to stop making [older insulin], because they don't feel that they can make as many millions—and, frankly, billions—of dollars," Hirsch says.

And there is a larger philosophical issue at play. We're up against an unsustainable cost increase, and at some point there will be sacrifices to care.

"We are literally going backwards," says Hirsch. "We are going back to using old insulins, we are seeing more ketoacidosis, everything that we were supposed to see moving forward with better pharmaceuticals, better innovation, in actuality, they've outpriced it."

### Lack of Competition

The United States, unlike some other countries around the world, does not regulate the price of prescription drugs. One of the reasons insulin is rising in price so much is, essentially, because drug companies set the starting price—and lifesaving insulin must be purchased.

"We don't have a very healthy competitive insulin market," says Lipska. As it is, only a few companies

make insulin, and the cost of all of them keeps going up. This suggests there's no real price competition.

Typically, the price of a prescription will be tempered when generic drugs enter the market after patents expire. These cheaper generics create competition for brand-name drugs, forcing them to bring down their prices.

So, where are these generic forms of insulin? Currently, there are no generic insulin products in the United States, and the reason why is complicated. For one, insulin is considered a biologic rather than small-molecule drug because it's made from living cells, and all generic forms of biologics, called biosimilars, are subject to more stringent approval standards than small-molecule generics. So it's much more expensive, more complex, and more difficult to achieve a "copy" of the original.

Because of the larger financial burden of manufacturing biosimilars, they would likely not lead to the same 90 percent price reduction seen with other generic meds. Experts estimate that it would be more like a 20 to 40 percent reduction in price, says Lipska, though most are leaning toward the low end of that range. Still, that should bring down the price of some of the most costly insulin, particularly the analogs.

How soon until we see a biosimilar hit U.S. markets? Basaglar, a pen-based version of insulin glargine manufactured by Eli Lilly and Boehringer Ingelheim, is approved as a biosimilar in Europe and as a

follow-on medication (a drug similar to an already approved product) in the United States. The launch date is currently December 2016.

The dawn of these biosimilars is one reason prices are out of control, says Hirsch: Drug companies are trying to rake in as much money as they can before these cheaper alternatives enter the market.

### Long-Term Solutions

Aside from biosimilars entering the market to create healthy competition for brand-name insulin, action in other ways could help this growing problem.

One controversial solution is for the government to step in with some kind of regulation. "I wonder if putting a ceiling on how much insulin companies can charge for insulin would be one option," says Lipska.

Luo agrees that some kind of regulation could help, because what's happening now isn't working. "The way Congress has mandated it [for Medicare] is that we shall have the private market take care of drug prices," he says. But as Lipska's research shows, costs haven't been contained through the private market.

A more-promising solution, he says, is to start a dialogue with all of the big players, including insulin companies and pharmacy benefit managers. "We need to open dialogue with everybody so that people realize the massive profit-taking that has happened in the last few years can't happen with insulin the way it's happening with the rest of medicine."

This sentiment is gaining ground in the cost conversation, and serves as an important reminder. The humanitarian spirit accompanied the discovery of insulin, and its lifesaving ability remains. "It's not a concierge item," says Hirsch. "It's required for survival." ▲

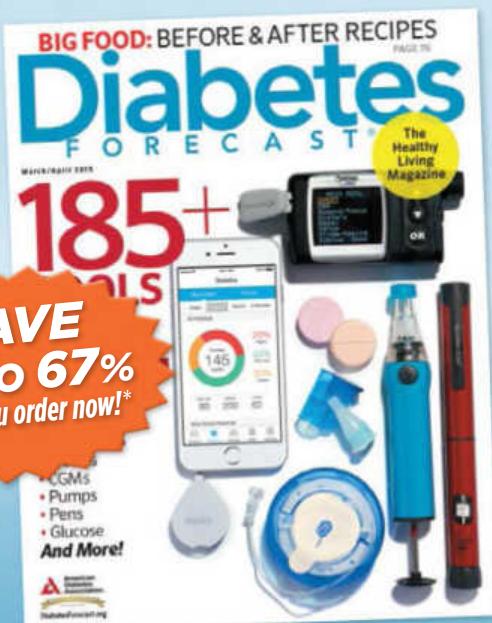
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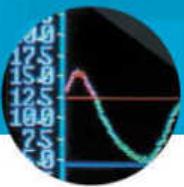
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● By Tracey Neithercott

# The New Wave

## 12 products in the diabetes pipeline

The good news: Thanks to some smart thinking, the diabetes pipeline is packed with prototype products that aim to make your life easier. The bad news? Innovation takes time—and a lot of testing and clearing of regulatory hurdles before devices and medications make it to market. We've picked a dozen products that we think are worth the wait.

Read on for a glimpse of the future.



### 1 METER

If you're sick and tired of clunky meters that scream "medical device," you're not alone. Jeff Dachis was so put off by the diabetes technology available when he was diagnosed with latent autoimmune diabetes in adults (LADA) 2½ years ago that he decided to create his own. His company, One Drop, has been selling its app on Apple devices (expect an Android version this year) and plans to add a blood glucose meter to the mix. The idea is similar to other subscription-based blood glucose monitoring programs, such as Livongo Health's: Users pay a monthly fee and in return receive a **One Drop meter**, lancing device, carrying case, and unlimited test strips. The meter will wirelessly transmit blood glucose results to the One Drop app, which will automatically log glucose readings—other data, including exercise, food, and medications, require manual input—and connect users via a social network. While the meter hasn't yet been cleared by the Food and Drug Administration (FDA), the company is shooting for a release at the end of this year.

### 2 PUMP

The company that gave us a pump that stops insulin delivery when glucose levels get too low is plotting two more devices that will come even closer to an artificial pancreas. Next up for Medtronic is the **MiniMed 640G**. While the currently available 530G uses a built-in continuous glucose monitor (CGM) to suspend insulin delivery when glucose levels hit a preset low value and you fail to respond to an alert, the next-generation pump predicts when glucose will hit a predetermined threshold 30 minutes before your glucose dips that low and stops insulin delivery. After two hours or when your glucose starts to rise from the low threshold, insulin delivery begins again. The 640G will usher in Medtronic's new pump design and sensor. The company has finished a pivotal trial on the system in the United States and is currently prepping to submit to the FDA.

for clearance. Further down the pipeline is Medtronic's **hybrid closed-loop pump**, which uses a built-in CGM to adjust basal (but not bolus) insulin on its own. Medtronic plans to send data on it to the FDA for review in mid-2016.

## 3

### GLUCAGON

When low blood glucose is left untreated, it can lead to unconsciousness. Enter glucagon, a hormone produced in the pancreas that raises levels of glucose in the blood. The only option for delivery of a rescue dose is via an injectable solution that must be mixed right before it's given. But an **inhalable powder glucagon** may be on its way. Eli Lilly and Co. is developing intranasal glucagon (formally in development by Locemia), given by a friend, family member, or caregiver when a person with diabetes is unable to self-treat with oral glucose. With the press of a plunger, the device delivers a puff of glucagon up the nose, where it's absorbed into the nasal passages. The drug is currently undergoing Phase 3 clinical trials in adults and children, and the company is staying mum on when it plans to submit to the FDA.

## 4

### INFUSION SET

When insulin delivery is blocked, your pump will sound an occlusion alarm. At least, it's supposed to. But sometimes interruptions in insulin flow are undetected by an insulin pump, which can lead to high blood glucose. Becton, Dickinson, and Co. is hoping to sidestep that problem with its first insulin infusion set. Using BD's **FlowSmart technology**—a catheter with an opening on the side as well as at the tip—the set improves insulin flow to cut down on the number of interruptions. The product will work with Medtronic pumps as well as those with Luer-lock connectors. A bonus: The infusion set uses a thinner needle to insert the catheter than others on the market. The FDA cleared the set last year, and it's expected to launch in the United States this year.

## 5

### PUMP

A few years ago, the V-Go insulin delivery device hit markets as a lower-tech alternative to insulin pumps for people with type 2. Unilife hopes to give V-Go some competition with its **Imperium patch pump**, a prefilled, disposable insulin delivery device that prides itself on its simplicity: peel the adhesive backing, stick the pod to your body, and press a button to insert the needle or cannula and begin. Imperium combines a preset basal rate with bolus delivery via a button on the device's body. Bluetooth connectivity means the pump can integrate with smartphone apps. But don't expect to see a Unilife pump on the market—the manufacturer plans to partner with pharmaceutical companies, which will supply the insulin then sell the device as their own in much the same way insulin pens are filled and sold. Imperium has not been approved by the FDA.

**The infusion set uses a thinner needle to insert the catheter than others on the market.**



# The New Wave

## 6

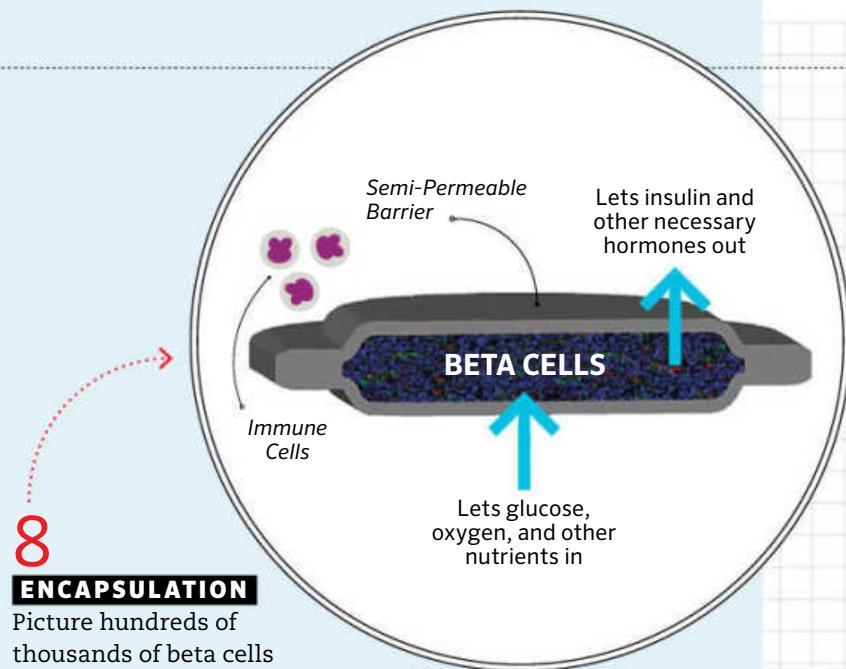
### INSULIN

Refrigeration of insulin can range from a frustrating inconvenience (say, if you're struggling to keep your insulin cool while traveling) to a serious challenge (if you live in a sweltering part of the world, such as India, without access to a refrigerator). Researchers at Thermalin are hoping to bypass those issues with their **ultra-heat-stable long- and rapid-acting insulins**. Unlike the insulins available today, which retain peak potency an average of 30 days at room temperature if unopened, Thermalin's ultra-heat-stable insulins can spend a year in body-temperature environments up to 115 degrees without losing potency. In testing, the insulins worked even after being boiled. The benefit to people in areas with limited access to refrigeration is clear, but the company sees another possibility: If the insulin can stay potent for months at body temperatures, an implanted closed-loop pump may be a future reality.

## 7

### CGM

Convenience is king when it comes to Dexcom's **next-generation glucose sensor**. If the CGM giant has its way, users will be treated to fewer calibrations (just once every 24 hours), which means fewer finger sticks, and fewer sensor changes (the company's aiming for a device you can wear for 10 days). Also in development: a sensor applicator that reduces pain by using a single button press to attach the device to the body, plus a smaller transmitter. The ultimate goal is for a disposable, dime- or nickel-sized transmitter, which Dexcom hopes to create through its partnership with Google. As for the CGM system's near future, look for an Apple watch app for the G5 Mobile system (not to be confused with Dexcom's Share app) in the first half of this year and integration with Android devices in the second half.



## 8

### ENCAPSULATION

Picture hundreds of thousands of beta cells trapped in a strip of perforated plastic and implanted in your body. Now imagine those cells can produce insulin in just the right amounts—and replace injections. That could be a reality if ViaCyte's vision is realized. The company is currently testing its **beta cell replacement therapy** in a group of people with diabetes. While this Phase 1 and 2 trial will continue for two years, researchers will evaluate the safety and efficacy of the therapy after all participants have been treated for six months—some time around August 2017. Provided the treatment is safe and the implant is working well, the company will conduct one or more additional clinical trials before seeking FDA approval. For more on beta cell encapsulation, check out [diabetesforecast.org/cellencapsulation](http://diabetesforecast.org/cellencapsulation).

## 9

### METER

Schlepping around a superabundance of diabetes supplies can be annoying, especially if you don't carry an oversized handbag. Enter the **SugarCube**, a Bluetooth-capable blood glucose meter that stores test strips and lancets and stashes one of nine brand-name pens for easy delivery of insulin or a type 2 injectable drug. While blood glucose

That's  
an insulin  
pen!



Illustration courtesy of ViaCyte

readings are visible on the meter face, the device is more useful with the SugarCube app, which logs glucose data (automatically for Bluetooth-capable meters, such as the SugarCube, or manually for others), tracks diet and exercise, and creates reports. An added benefit: The data sync to the cloud, allowing you and your doctor to view reports in real time. The app will be available on Apple devices this March and on Android devices come May. As for the SugarCube meter, the company plans to submit to the FDA in September and hopes to begin shipping in December.

## 10 PEN

If you love your insulin pens but want more pump-like functions—without sticking anything to your skin—you may be in luck. What's currently being called the **InPen** looks like a traditional insulin pen and works like one, too—but it also links to a smartphone app. Insert a prefilled insulin cartridge (NovoLog- and HumaLog-ready versions will be available at launch) and get ready to dose. Download the app to move beyond the basics—you can view data on past doses, calculate a dose, set reminders, and more on a mobile device. Manufacturer Companion Medical has plans to partner with Glooko, Tidepool, and Dexcom data management software, but that probably won't happen by the time the product launches. As for a release date, there's none yet, but the company plans to submit to the FDA this year.

## 11

### GLUCAGON

Another alternative to glucagon injections is a **glucagon patch**, currently in development by Zosano Pharma. Here's how it works: A quarter-sized patch holds hundreds of drug-coated microneedles on its underside. Unlike glucagon injections, Zosano's version uses a handheld device to apply the patch to the skin in a few short steps for a quick rescue. Once the patch is in place, the drug

Dosing  
data on its  
way!



## 12 MANAGEMENT SYSTEM

With health care providers in high demand, you might not get the hands-on care you want. Some companies are looking to bridge the gap with products and services that aim to make managing diabetes easier. Hygieia's **d-Nav system** hopes to do just that with its prescription blood glucose meter, software for patients and health care providers, and d-Nav Care Centers.

The interplay between each aspect is what makes the system work: Nurses and clinical pharmacists at the center train patients (only adults, most with type 2, and not on insulin pumps) on the system and follow up regularly to conduct A1C tests and assess treatment changes. Those treatment changes are based on weeks of blood glucose readings collected by a meter that uses a special algorithm to adjust insulin therapy as needed. Rounding out the system is online software that connects patients and health care providers with glucose data. The company hopes American users will see the sorts of benefits its patients in the United Kingdom have—namely, a reduction in medications and lower A1Cs. Hygieia is currently conducting a National Institutes of Health-funded study in three U.S. cities, and it has plans to expand that in 2016 with the goal of a 2017 launch stateside.

● By Lindsey Wahowiak

# What Matters Most

People weigh in on why they use their diabetes management products

We chatted with 11 people with diabetes about what they look for in their diabetes management tools—what works for them, what they love, and what they wish for.

## BLOOD GLUCOSE METERS

● Blood glucose meters are one of the few tools that can be used by nearly all people with diabetes. From women with gestational diabetes and folks who have prediabetes to those who have lived with type 1 or type 2 for decades, everyone with diabetes can benefit from the information you can get from just a tiny drop of blood on a test strip. A meter can tell you a lot about how your blood glucose is doing at this very moment. With dozens of meters on the market, special features help set devices apart from one another.

**Downloadable data:** **Wes Lyons**, 33, of Valhermoso Springs, Alabama, uses Bayer's Contour Next USB meter because of its download feature, which puts all of his blood glucose readings into a spreadsheet. By examining trends, Lyons learns what causes him to spike—and that helps him make healthier choices to control his type 2 diabetes. "It helps to compare what I'm doing versus what my levels were," Lyons says. Using data from his meter and a calendar, Lyons is able to pinpoint what his schedule was like when his blood glucose spiked or dropped.

**Tomiko Lane**, 44, of Apex, North Carolina, also likes the download capabilities of her meter. Lane, who has type 2 diabetes, was



given her Lifescan OneTouch Ultra by her doctor and says she's a creature of habit, so she has kept up with it. "I like that it has the table that you can [use to] keep track and see trends," Lane says. "That's what my doctor also does. My insurance was trying to give me a new meter, and I was asking, 'Does it have the tables?'"

**Cost effectiveness:** The one-time cost of a meter isn't much compared with the cost of test strips, especially for folks who test many times per day. That's why **Charles Nokes**, 43, of Nashville, Tennessee, has stuck with his ReliOn Prime meter since being diagnosed with type 2 diabetes in

June 2013. Walmart's house-brand meters and strips are readily available at the chain's many locations for relatively low cost. "When my doctor first diagnosed me, he said he didn't suggest me going out and buying something really expensive unless he felt [the inexpensive model] wasn't doing the job," Nokes says. "It was a little \$15 meter, and then the strips [were] \$9 for 50. Now they have a super pack with 100 strips, and it's \$17."

**Seeing the light:** **Kassie Tyvela**, 34, of Bay City, Michigan, has type 1 diabetes and says her VerioIQ meter's color screen makes seeing her results a breeze. But what really seals the deal are the meter's test strip port light and two-sided test strips, which double the number of checks she can do with one pack. She likes this meter so much she had her pharmacy order it specifically for her.

## INSULIN DELIVERY SYSTEMS

● There are several ways to deliver insulin. Insulin users can reach for traditional vials and syringes, insulin pens, insulin pumps, and—if it stays on the market—one inhaled product. Your type of therapy (basic or intensive), your insurance coverage, and your preferences are part of the purchasing decision.

**Insulin pumps for tighter control:** **Alejandra Marquez**, 36, of Greensboro, North Carolina, began using an insulin pump when she started trying to get pregnant. Before leaving her native Venezuela for the United States in 2010, Marquez had not seen many pumps. But here, as part of DiabetesSisters, a nationwide support group for women with diabetes, she says many folks she knows with type 1 diabetes are pumbers, like herself. "It's easy for me to control with the pump," she says. It paid off: After going on

**If I'm getting the low alerts and not responding, it shuts the pump off. It has happened a couple of times overnight, and it's probably saved me from an ER visit.**

Amanda Holmberg

the Minimed Paradigm Real-Time Revel pump in 2011, Marquez is now mom to healthy baby Lucas, born in August 2014.

### Pumps for constant control: **Amanda Holmberg**

39, of Arlington, Virginia, loves that her Medtronic MiniMed 530G, like all pumps, delivers a constant programmed stream of background or basal insulin—except when it doesn't. And that's something she loves even more. The MiniMed 530G is the first device cleared by the Food and Drug Administration with Threshold Suspend technology, which stops insulin delivery for up to two hours if blood glucose hits a certain low point and the user doesn't respond to the alarm. This feature is great for people who, like Holmberg, have hypoglycemia unawareness. "If I'm getting the low alerts and not responding, it shuts the pump off," she says. "It has happened a couple of times overnight, and it's probably saved me from an ER visit."

**Pumps for safety and simplicity:** Tyvela runs a day care out of her home, so keeping sharps away from little hands is a must. "I like that I can bolus on the go," she says of her Medtronic Paradigm 720. "I like that I don't have to use syringes."

**Pumping tiny doses:** **Sylvia Bustard's** son, Johnny, was diagnosed with type 1 diabetes when he was just 14 months old. Because Johnny was so small, he often needed doses of insulin less than 1 unit—tough to deliver with a syringe but no problem for pumps, which can be programmed to deliver boluses in increments as low as 0.01 units. Now 4 years old, Johnny, who lives with his family in Southington, Ohio, still uses his Medtronic MiniMed Paradigm Real-Time Revel. "At the time, there were only a few pumps offering micro dosing, which is why we chose that pump," says Sylvia.

# What Matters Most

**Elsie Hunt**, 3, of Goshen, Indiana, and her family also looked for micro dosing when selecting a pump. Elsie uses Tandem Diabetes Care's T:slim pump. "We could only give as little as a half a unit of insulin with the syringes, and our usual doses were 0.25 or even smaller. So since we couldn't give that little, her sugars remained higher as we would just wait until her sugar rose and correct it at a later time," says her mom, **Sarah Hunt**. "With the T:slim, we can give [basal] doses as small as .001 units, so we get a more well-maintained blood sugar level."

**Inhaled insulin:** **Cynthia Rogers**, 37, of Boise, Idaho, uses Afrezza, a new insulin delivery system that allows users to inhale, rather than inject, their mealtime insulin. (Whether the product will stay on the market or be withdrawn like its predecessor because of lack of sales remains to be seen.) A desire for non-needle delivery drove the product's development, but Rogers found a personal benefit. She's in recovery from diabulimia, an eating disorder in which someone with diabetes withholds insulin to avoid gaining weight, and getting the benefits of insulin without the sense of "units" is a big deal. "It doesn't register to me as units," she says. "I don't feel like I'm injecting insulin and 'getting fat.' For me, that's a great tool to introduce for recovery. It just seems different." Keep in mind: Afrezza dosing may not be precise enough for people who require very small doses of insulin.

**Pen/syringe combo:** Juggling multiple kinds of injectable medications can be tricky, especially if you have poor eyesight, a possible complication of diabetes. Because insulin vials all look similar, it can be easy to grab your fast-acting insulin when you mean to grab your long-acting. And it's easy to make mistakes with pens, too. That can be dangerous. So **Asha Brown**, 30, of Minneapolis, who has type 1 diabetes, takes Lantus by traditional vial and syringe and Symlin, another blood glucose-lowering injectable, in a pen form. "I have a really busy life, and this way it's fairly effortless for me to never make that mistake," she says.



Open the App Store or Google Play on your smartphone and you might be overwhelmed by all of the health apps available to you. Some allow you to track blood glucose. Others track food intake or activity. Charles Nokes, 43, of Nashville, Tennessee, uses **My Glucose Buddy**. "I've tried several different ones, but I really enjoyed doing that one because it also had a way that you could [log] your A1C, your weight, your blood pressure, and everything," he says. The app sends all logged information to a printable Excel spreadsheet, as well.

“  
**With this  
sensor, it  
helped me to  
understand  
how my body  
worked with  
the food.**  
”

Alejandra Marquez

**Pens for on-the-go ease:** Insulin pens are an easy and discreet way to keep both medication and device in one neat package. Lane uses pens to take Lantus and deliver Victoza, a non-insulin drug used to manage type 2. She says her doctor suggested pens to her as the simplest way to inject the drugs.

## CONTINUOUS GLUCOSE MONITORS

● By wearing a continuous glucose monitor (CGM) that uses a sensor to constantly track glucose levels, users get a complete view of how medication, food, and exercise affect blood glucose. While an unending stream of information can be too much for some—or be one too many items attached to their body, which Tyvela found to be true for her—others relish the potential goldmine of data a CGM provides. Here are just some of the reasons people use CGMs:

**For peace of mind:** Marquez loves how her Dexcom CGM gives her real-time trend data that she can see easily on the receiver without a finger stick, which she says was especially important when she was breastfeeding, which can cause blood glucose to drop. "With this sensor, it helped

me to understand how my body worked with the food," she says. "I can see, immediately, with the graphic, and I can figure out what I need to do." But note: Meters and finger sticks are still necessary for checks done before giving boluses or correction doses, before treating lows (unless you have symptoms), and for calibration.

**For staying accountable:** For Rogers, her Dexcom CGM with data sharing software is a tool that helps her share her glucose readings with trusted sources. "I absolutely would choose my CGM above anything," she says. "It's the only way to know what's going on. Somebody else has eyes on me; my husband also sees the data."

**For special features:** Because all CGMs have similar accuracy, it's the special features that really make a product right for someone. For example, Brown loves her Dexcom because its sensors, worn on the body, last for seven days, the longest of products on the market. And she loves that its color screen is super friendly to the eye—no black-and-gray screens here.

Asha Brown, 30, of Minneapolis, has been using the same **Securitee Blanket vial protector**, a cozy for insulin vials, for several years, and she says it's still as good as new. The little sleeve makes insulin vials easier to see and hold—great for people with vision issues or with peripheral neuropathy.

Brown also swears by **Dia-Pak Deluxe** by Medicool, a travel case that holds everything from her meter to extra test strips, lancing devices, and glucose tablets. Though the Dia-Pak works for her, Brown suggests everyone with diabetes find a kit that carries several days' worth of supplies and fits their own needs. "I'm never worried about running out of something," she says of her supply kit. "If you want to carry all your stuff in a Ziploc bag, if that works for you, then do it."



## STILL UNDECIDED

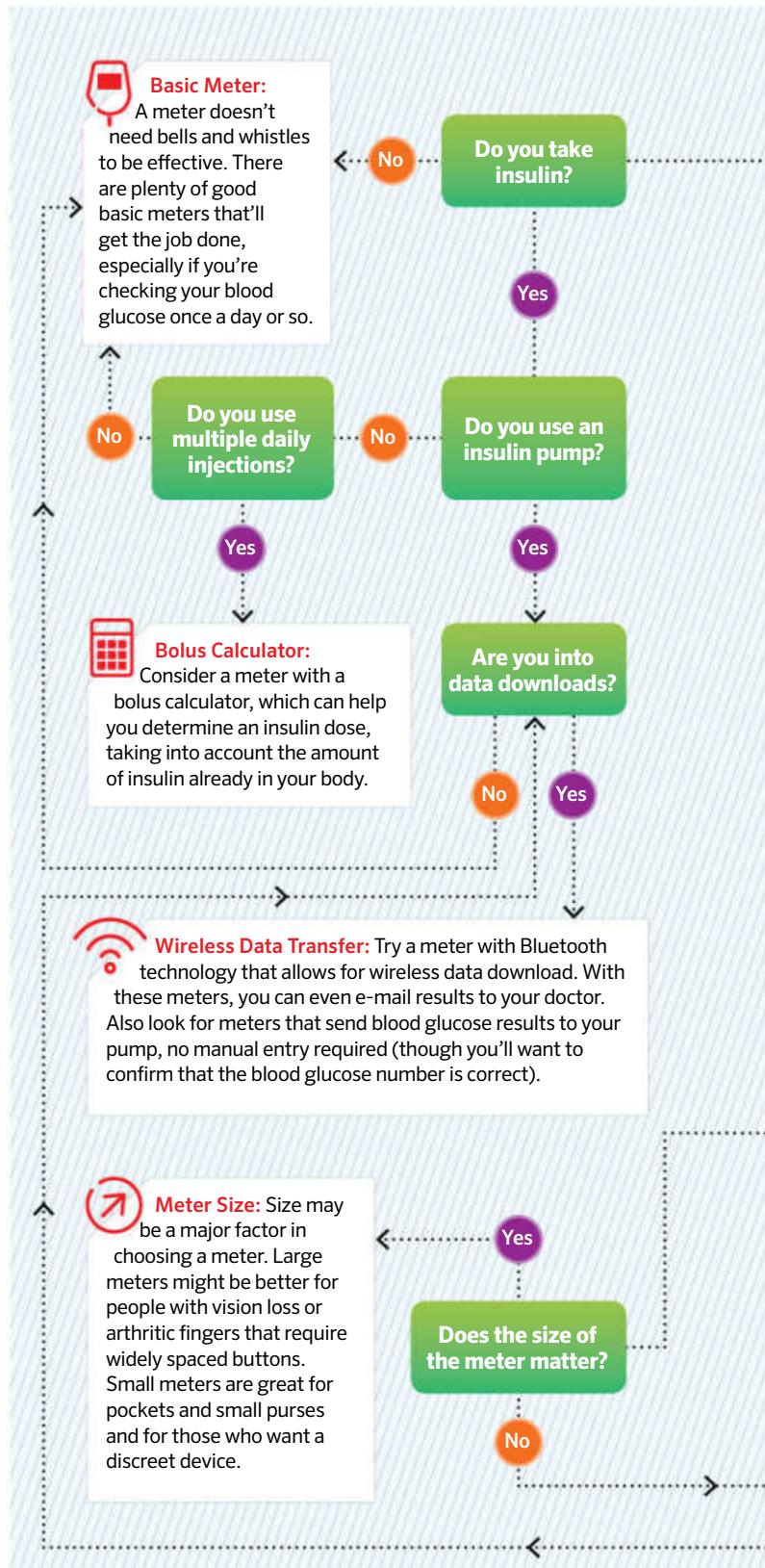
Talk to your doctor, but it's fine to hold out for a product you really want. Stephen Shaul, 53, of Baltimore, has been using his MiniMed Paradigm Real-Time Revel pump to manage his type 1 diabetes for so long that its warranty has expired. But until he finds something new that meets his standards (and that his insurance will pay for), the Revel will have to do. "Maybe I'm too picky, but I haven't found anything that really wows me," he says. "I'm making sure I [buy] something I feel comfortable with for the next four years before [its] warranty is out."

There's no hard-and-fast rule on when you need to replace your diabetes devices, but Lisa Merrill, MS, RD, CDE, sees no harm in waiting for what you really want. "To me, if something ain't broke, why fix it?" she says. "Let the bugs get worked out of new technology before getting something new." But technology is constantly evolving, says Heather Free, PharmD, so it might be useful to talk with a health care provider about innovations that can best serve you.

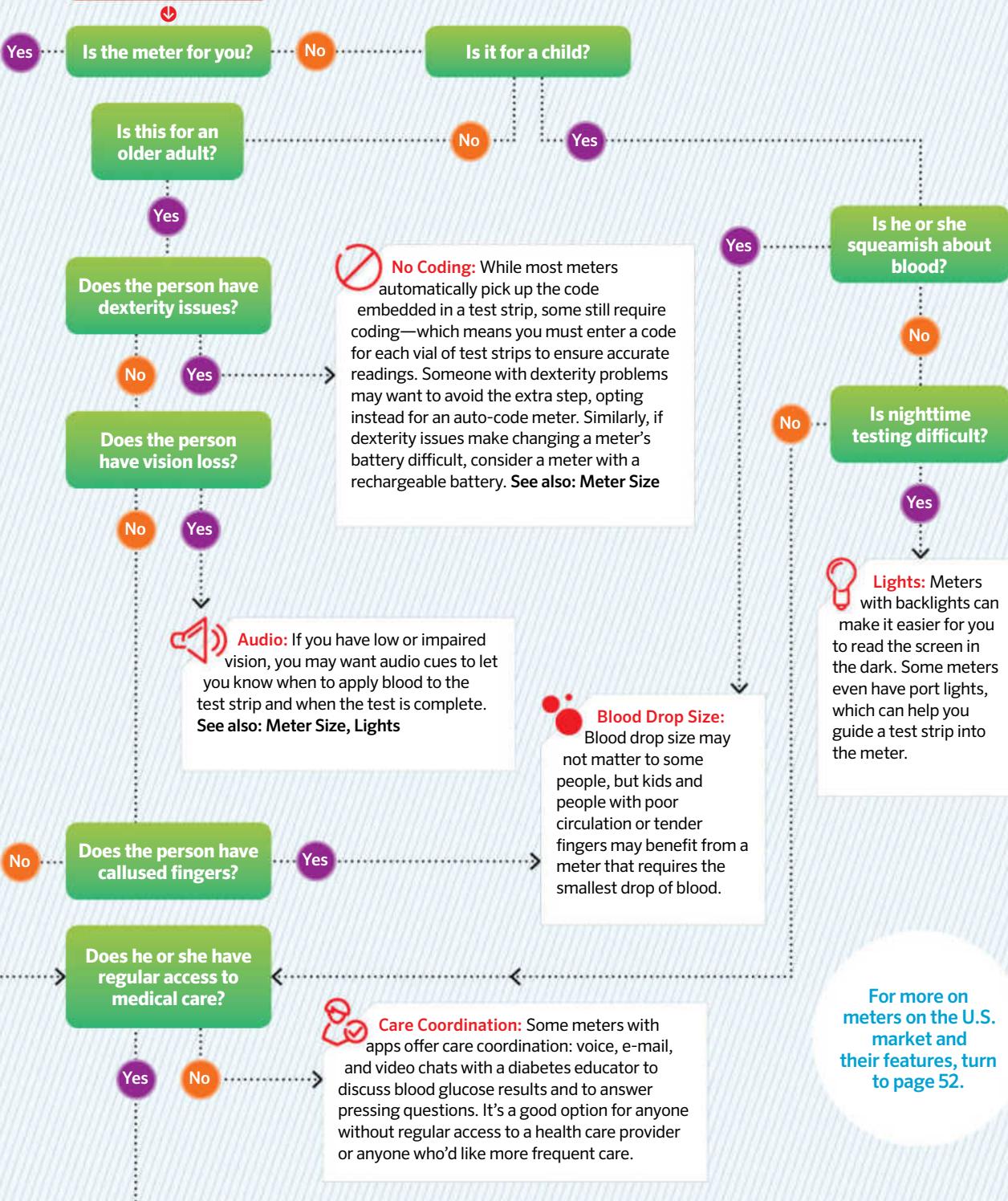


# The Right Meter for You

You may not have chosen your first meter. Maybe your doctor gave one to you or perhaps you purchased the first model you found at your local pharmacy. But with dozens of meters on the market, it pays to do some research and find a device that fits your lifestyle. The first step: Start with the decision tree (at right) and find out which features will best suit you.



## Start Here

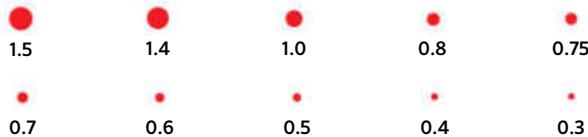


For more on  
meters on the U.S.  
market and  
their features, turn  
to page 52.

# Blood Glucose Meters

## BLOOD DROP SIZE

Meters specify how much blood is needed to get an accurate reading. Blood drop size is measured in microliters, as shown below. Some meters allow you to reapply blood within a few seconds if your sample size was too small, so you don't waste a strip.



## KEY

= audio capability = backlight = port light **BP** = measures both blood glucose and blood pressure **BT** = wireless Bluetooth capability

**C** = requires user coding = Can save data to the cloud without having to push the data to another device

= computer download capability **K** = also tests blood ketones **P** = communicates with insulin pump \*Microliters

\*\*Sold only with insulin pump **MSRP** = manufacturer's suggested retail price. These are over-the-counter retail prices; check with your insurance plan for specific coverage and how much you may have to pay.

## Abbott Diabetes Care

[myfreestyle.com](http://myfreestyle.com)

1-888-522-5226



### FreeStyle Freedom Lite

Features:

Blood Sample Size\*: 0.3 •

Battery: 1 CR2032

MSRP: \$19.99

Strips MSRP: \$1.46-\$1.52/strip (\$73-\$76/50 strips)



### FreeStyle InsuLink

Features:

Blood Sample Size\*: 0.3 •

Battery: 3 CR2032

MSRP: \$49.99

Strips MSRP: \$1.54-\$1.60/strip (\$77-\$80/50 strips)



### FreeStyle Lite

Features:

Blood Sample Size\*: 0.3 •

Battery: 1 CR2032

MSRP: \$19.99

Strips MSRP: \$1.46-\$1.52/strip (\$73-\$76/50 strips)



### FreeStyle Precision Neo

Features:

Blood Sample Size\*: 0.6 •

Battery: 2 CR2032

MSRP: \$17.99-\$24.99

Strips MSRP: 40¢-44¢/strip (\$19.99-\$21.99/50 strips)

## AgaMatrix

[agamatrix.com](http://agamatrix.com)

1-866-906-4197



### WaveSense Presto

Features:

Blood Sample Size\*: 0.5 •

Battery: 2 CR2032

MSRP: \$19.99

Strips MSRP: 25¢/strip (\$24.99/100 strips)



### WaveSense PrestoPro

Features:

Blood Sample Size\*: 0.5 •

Battery: 2 CR2032

MSRP: \$19.99

Strips MSRP: 25¢/strip (\$24.99/100 strips)

## Arkay

[arkayusa.com](http://arkayusa.com)

1-800-566-8558



### Glucocard 01

Features:

Blood Sample Size\*: 0.3 •

Battery: 1 CR2032

MSRP: \$19.95

Strips MSRP: 55¢/strip (\$27.95/50 strips)



### Glucocard Expression

Features:

Blood Sample Size\*: 0.8 •

Battery: 2 AAA

MSRP: \$19.95

Strips MSRP: \$1.24/strip (\$61.95/50 strips)



### Glucocard Shine

Features:

Blood Sample Size\*: 0.5 •

Battery: 2 CR2032

MSRP: \$19.95

Strips MSRP: 46¢/strip (\$22.95/50 strips)



### Glucocard Vital

Features:

Blood Sample Size\*: 0.5 •

Battery: 1 CR2032

MSRP: \$19.95

Strips MSRP: \$1.20/strip (\$54.95/50 strips)

**What about accuracy?** All meters are tested and approved by the Food and Drug Administration, and they're held to the same accuracy standards. That said, testing for accuracy once the meter hits the market is not done. For more on meter accuracy, visit [diabetesforecast.org/meteraccuracy](http://diabetesforecast.org/meteraccuracy).

**Bayer**  
[contournext.com](http://contournext.com)  
1-800-348-8100



#### Contour

**Features:**   
**Blood Sample Size\***: 0.6 •  
**Battery**: 2 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: \$1.26/strip (\$62.95/50 strips)



#### Contour Next

**Features:**   
**Blood Sample Size\***: 0.6 •  
**Battery**: 2 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: 83¢/strip (\$41.55/50 strips)



#### Contour Next EZ

**Features:**   
**Blood Sample Size\***: 0.6 •  
**Battery**: 2 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: 83¢/strip (\$41.55/50 strips)



#### Contour Next Link\*\*

**Features:**   
**Blood Sample Size\***: 0.6 •  
**Battery**: Rechargeable via computer or wall charger  
**MSRP**: Sold only with Medtronic pumps  
**Strips MSRP**: 83¢/strip (\$41.55/50 strips)



#### Contour Next USB

**Features:**   
**Blood Sample Size\***: 0.6 •  
**Battery**: Rechargeable via computer or wall charger  
**MSRP**: \$29.99  
**Strips MSRP**: 83¢/strip (\$41.55/50 strips)

**BioSense Medical Devices**  
[biosensemd.com](http://biosensemd.com)  
1-877-592-3922



#### Solus Mobile

**Features:**   
**Blood Sample Size\***: 0.7 •  
**Battery**: Rechargeable lithium ion  
**MSRP**: Manufacturer declined to provide  
**Strips MSRP**: Manufacturer declined to provide



#### Solus V2

**Features:**   
**Blood Sample Size\***: 0.7 •  
**Battery**: 2 AAA  
**MSRP**: \$19.99  
**Strips MSRP**: 40¢/strip (\$19.99/50 strips)

**cvs**  
[cvs.com](http://cvs.com)  
1-800-746-7287



#### CVS Advanced Blood Glucose Meter

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 1 CR2032  
**MSRP**: \$17.99  
**Strips MSRP**: 23¢/strip (\$22.99/100 strips)



#### CVS Blood Glucose Monitor Featuring Truetrack Smart System

**Features:**   
**Blood Sample Size\***: 1.0 •  
**Battery**: 1 CR2032  
**MSRP**: \$14.99  
**Strips MSRP**: 53¢/strip (\$52.99/100 strips)



#### CVS True Metrix Self-Monitoring Blood Glucose Meter

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 1 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: 80¢/strip (\$39.99/50 strips)



#### CVS True Metrix Air Self-Monitoring Blood Glucose Meter

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 1 CR2032  
**MSRP**: \$24.99  
**Strips MSRP**: 80¢/strip (\$39.99/50 strips)

# Blood Glucose Meters

	<p><b>CVS Trueresult Blood Glucose Monitoring System</b> Features:   <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: 1 CR2032 <b>MSRP</b>: \$17.99 <b>Strips MSRP</b>: 70¢/strip (\$69.99/100 strips)</p>	<p><b>Fora Care</b> <a href="http://foracare.com">foracare.com</a> 1-805-498-8188</p> 	<p><b>Fora D40c, D40d, D40g 2-in-1</b> Features:    <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: 4 AA, 6V adaptor, and lithium ion <b>MSRP</b>: \$179 <b>Strips MSRP</b>: 80¢/strip (\$39.99/50 strips)</p>
<p><b>Diabetic Supply of Suncoast</b> <a href="http://dsosi.com">dsosi.com</a> 1-866-373-2824</p> 	<p><b>Advocate Redi-Code Plus Speaking Meter</b> Features:    <b>Blood Sample Size*</b>: 1.0 • <b>Battery</b>: 2 AAA <b>MSRP</b>: \$29.99 <b>Strips MSRP</b>: 50¢/strip (\$24.99/50 strips)</p>		<p><b>Fora G30</b> Features:  <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: 1 CR2032 <b>MSRP</b>: \$39.99 <b>Strips MSRP</b>: 80¢/strip (\$39.99/50 strips)</p>
<p><b>Entra Health</b> <a href="http://entrahealth.com">entrahealth.com</a> 1-877-458-2646</p> 	<p><b>MyGlucoHealth Wireless</b> Features:   <b>Blood Sample Size*</b>: 0.3 • <b>Battery</b>: 2 AAA <b>MSRP</b>: \$89.95 <b>Strips MSRP</b>: \$1/strip (\$49.95/50 strips)</p>		<p><b>Fora GD20</b> Features:  <b>Blood Sample Size*</b>: 0.7 • <b>Battery</b>: 1 CR2032 <b>MSRP</b>: \$29.99 <b>Strips MSRP</b>: 80¢/strip (\$39.99/50 strips)</p>
<p><b>Fifty50 Medical</b> <a href="http://fifty50.com">fifty50.com</a> 1-800-746-7505</p> 	<p><b>Fifty50 2.0</b> Features:  <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: (2) 3-volt lithium <b>MSRP</b>: \$39.95 <b>Strips MSRP</b>: 74¢/strip (\$36.95/50 strips)</p>		<p><b>Fora MD</b> Features:   <b>Blood Sample Size*</b>: 1.1 • <b>Battery</b>: 2 AAA <b>MSRP</b>: \$69.99 <b>Strips MSRP</b>: 80¢/strip (\$39.99/50 strips)</p>
	<p><b>Fifty50 2.0 Sport</b> Features:   <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: (2) 3-volt lithium <b>MSRP</b>: \$39.95 <b>Strips MSRP</b>: 74¢/strip (\$36.95/50 strips)</p>		<p><b>Fora Premium V10</b> Features:   <b>Blood Sample Size*</b>: 0.5 • <b>Battery</b>: 2 AAA <b>MSRP</b>: \$29.99 <b>Strips MSRP</b>: 80¢/strip (\$39.99/50 strips)</p>
			<p><b>Fora V12</b> Features:   <b>Blood Sample Size*</b>: 0.7 • <b>Battery</b>: 2 AAA <b>MSRP</b>: \$59.99 <b>Strips MSRP</b>: \$1/strip (\$49.99/50 strips)</p>

**Fora V30**

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 2 AAA  
**MSRP**: \$49.99  
**Strips MSRP**: 80¢/strip (\$39.99/50 strips)

**Test N' Go**

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: Lithium rechargeable polymer  
**MSRP**: \$89.99  
**Strips MSRP**: \$1.18/strip (\$59/50 strips)

**Test N' Go Voice**

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 2 AAA  
**MSRP**: \$79  
**Strips MSRP**: \$1.18/strip (\$59/50 strips)

**Genesis Health Technologies**  
[genesishealthtechnologies.com](http://genesishealthtechnologies.com)  
 1-888-263-0003

**Genesis Meter**

**Features:**   
**Blood Sample Size\***: 0.7 •  
**Battery**: Rechargeable  
**MSRP**: \$99.95  
**Strips MSRP**: \$1.08/strip (\$53.95/50 strips)

**iHealth Labs**  
[ihealthlabs.com](http://ihealthlabs.com)  
 1-855-816-7705

**Align**

**Features:** Unit plugs into smartphone to display results  
**Blood Sample Size\***: 0.7 •  
**Battery**: 3-volt CR1620  
**MSRP**: \$16.95  
**Strips MSRP**: 25¢/strip (\$12.50/50 strips)

**Smart Gluco-Monitoring System**

**Features:**   
**Blood Sample Size\***: 0.7 •  
**Battery**: 3.7-volt lithium ion  
**MSRP**: \$29.95  
**Strips MSRP**: 25¢/strip (\$12.50/50 strips)

**Infopia**

[infopiausa.com](http://infopiausa.com)  
 1-888-446-3246

**Element Compact**

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 2 CR2032  
**MSRP**: \$9.99  
**Strips MSRP**: 30¢/strip (\$14.99/50 strips)

**Element Compact V**

**Features:**   
**Blood Sample Size\***: 0.5 •  
**Battery**: 2 AAA  
**MSRP**: \$12.99  
**Strips MSRP**: 30¢/strip (\$14.99/50 strips)

**Element Plus**

**Features:**   
**Blood Sample Size\***: 0.3 •  
**Battery**: 2 AAA  
**MSRP**: \$14.99  
**Strips MSRP**: 40¢/strip (\$19.99/50 strips)

**LifeScan**  
[onetouch.com](http://onetouch.com)  
 1-800-227-8862

**OneTouch Ping\*\***

[animas.com](http://animas.com)  
 1-877-937-7867  
**Features:**   
**Blood Sample Size\***: 1.0 •  
**Battery**: 2 AAA  
**MSRP**: Sold only with Animas OneTouch Ping pump  
**Strips MSRP**: \$1.60/strip (\$79.99/50 strips)

**OneTouch Ultra2**

**Features:**   
**Blood Sample Size\***: 1.0 •  
**Battery**: 2 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: \$1.60/strip (\$79.99/50 strips)

**OneTouch UltraMini**

**Features:**   
**Blood Sample Size\***: 1.0 •  
**Battery**: 1 CR2032  
**MSRP**: \$19.99  
**Strips MSRP**: \$1.60/strip (\$79.99/50 strips)

# Blood Glucose Meters

	<p><b>OneTouch Verio Blood Glucose Monitoring System</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.4 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: \$1.66/strip (\$82.99/50 strips)</p>		<p><b>Oak Tree Health</b></p> <p><a href="http://oaktree-health.com">oaktree-health.com</a></p> <p>1-866-994-3345</p> <p><b>EasyMax NG/LTC</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 44¢/strip (\$22.20/50 strips)</p>
	<p><b>OneTouch Verio Flex</b></p> <p><b>Features:</b> BT </p> <p><b>Blood Sample Size*</b>: 0.4 •</p> <p><b>Battery</b>: 1 CR2032</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: \$1.66/strip (\$82.99/50 strips)</p>		<p><b>EasyMax Voice</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 33¢/strip (\$16.50/50 strips)</p>
	<p><b>OneTouch VerioIQ</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.4 •</p> <p><b>Battery</b>: Rechargeable 3.7-volt lithium</p> <p><b>MSRP</b>: \$29.99</p> <p><b>Strips MSRP</b>: \$1.66/strip (\$82.99/50 strips)</p>		<p><b>EasyMax Voice 2nd Generation</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 33¢/strip (\$16.50/50 strips)</p>
<p><b>Livongo Health</b></p> <p><a href="http://livongo.com">livongo.com</a></p> <p>1-866-435-5643</p> 	<p><b>In Touch</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.8 •</p> <p><b>Battery</b>: Rechargeable lithium ion</p> <p><b>MSRP</b>: \$75/month</p> <p><b>Strips MSRP</b>: Unlimited strips included in monthly price</p>		<p><b>Fortis Care EM66</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 44¢/strip (\$22.20/50 strips)</p>
<p><b>Nova Diabetes Care</b></p> <p><a href="http://novacares.com">novacares.com</a></p> <p>1-800-681-7390</p> 	<p><b>Nova Max Link</b></p> <p><b>Features:</b>  communicates with Medtronic MiniMed insulin pumps</p> <p><b>Blood Sample Size</b>: 0.3 •</p> <p><b>Battery</b>: 1 CR2450</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 40¢/strip (\$19.99/50 strips)</p>		<p><b>Fortis Care EME</b></p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 44¢/strip (\$22.20/50 strips)</p>
	<p><b>Nova Max Plus</b></p> <p><b>Features:</b>  K</p> <p><b>Blood Sample Size*</b>: 0.3 • (for blood glucose), 0.8 • (for ketones)</p> <p><b>Battery</b>: 1 CR2450</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 40¢/blood glucose strip (\$19.99/50 blood glucose strips); \$2/ketone strip (\$19.99/10 ketone strips)</p>		<p><b>Fortis Care MDT2</b></p> <p><b>Features:</b> BT </p> <p><b>Blood Sample Size*</b>: 0.6 •</p> <p><b>Battery</b>: 2 AAA</p> <p><b>MSRP</b>: \$19.99</p> <p><b>Strips MSRP</b>: 40¢-44¢/strip (\$20-\$23/50 strips)</p>

	<p><b>Fortis Care MU</b></p> <p>Features:  </p> <p>Blood Sample Size*: 0.6 •</p> <p>Battery: 2 AAA</p> <p>MSRP: \$24.95</p> <p>Strips MSRP: 40¢-46¢/strip (\$20-\$23/50 strips)</p>		<p><b>Gmate Voice</b></p> <p>Features:  </p> <p>Blood Sample Size*: 0.5 •</p> <p>Battery: 2 AAA</p> <p>MSRP: \$38</p> <p>Strips MSRP: \$1.99/strip (\$99.50/50 strips)</p>	
	<p><b>Fortis Care (T2) R13N</b></p> <p>Blood Sample Size*: 0.6 •</p> <p>Battery: 1 CR2032</p> <p>MSRP: \$19.99</p> <p>Strips MSRP: 33¢/strip (\$16.50/50 strips)</p>	<p><b>Prodigy Diabetes Care</b></p> <p><a href="http://prodigymeter.com">prodigymeter.com</a></p> <p>1-800-243-2636</p>		
<p><b>Omnis Health</b></p> <p><a href="http://omnishealth.com">omnishealth.com</a></p> <p>1-877-979-5454</p>			<p><b>Prodigy AutoCode</b></p> <p>Features:  </p> <p>Blood Sample Size*: 0.7 •</p> <p>Battery: 2 AAA</p> <p>MSRP: \$9.94</p> <p>Strips MSRP: 45¢/strip (\$22.44/50 strips)</p>	
	<p><b>Embrace</b></p> <p>Features:  </p> <p>Blood Sample Size*: 1.0 •</p> <p>Battery: 2 AAA</p> <p>MSRP: \$17.99</p> <p>Strips MSRP: 22¢/strip (\$10.99/50 strips)</p>	<p><b>Prodigy Pocket</b></p> <p>Features: </p> <p>Blood Sample Size*: 0.7 •</p> <p>Battery: 1 CR2032</p> <p>MSRP: \$9.94</p> <p>Strips MSRP: 45¢/strip (\$22.44/50 strips)</p>		
	<p><b>EmbraceEVO</b></p> <p>Blood Sample Size*: 0.8 •</p> <p>Battery: 1 CR2032</p> <p>MSRP: \$17.99</p> <p>Strips MSRP: 22¢/strip (\$10.99/50 strips)</p>		<p><b>Prodigy Voice</b></p> <p>Features:  </p> <p>Blood Sample Size*: 0.7 •</p> <p>Battery: 2 AAA</p> <p>MSRP: \$68.75</p> <p>Strips MSRP: 45¢/strip (\$22.44/50 strips)</p>	
	<p><b>EmbracePRO</b></p> <p>Blood Sample Size*: 0.5 •</p> <p>Battery: 1 CR2032</p> <p>MSRP: \$14.99</p> <p>Strips MSRP: 22¢/strip (\$10.99/50 strips)</p>	<p><b>Roche</b></p> <p><a href="http://accu-chek.com/us">accu-chek.com/us</a></p> <p>1-800-858-8072</p>		
<p><b>Philosys</b></p> <p><a href="http://gmate.com">gmate.com</a></p> <p>1-855-GO-GMATE</p>			<p><b>Accu-Chek Aviva Combo**</b></p> <p>Features:   </p> <p>Blood Sample Size*: 0.6 •</p> <p>Battery: 3 AAA</p> <p>MSRP: Sold only with Accu-Chek Combo pump</p> <p>Strips MSRP: \$1.50/strip (\$79.99/50 strips)</p>	
	<p><b>Gmate Smart</b></p> <p>Features: Unit plugs into smartphone to display results</p> <p>Blood Sample Size*: 0.5 •</p> <p>Battery: None</p> <p>MSRP: \$19.95</p> <p>Strips MSRP: 50¢/strip (\$24.95/50 strips)</p>		<p><b>Accu-Chek Aviva Connect</b></p> <p>Features:   </p> <p>Blood Sample Size*: 0.6 •</p> <p>Battery: 2 CR2032</p> <p>MSRP: \$29.99</p> <p>Strips MSRP: 79¢/strip (\$70.97/50 strips; \$141.94/100 strips)</p>	

# Blood Glucose Meters

	<p><b>Accu-Chek Aviva Expert</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.6 •  <b>Battery:</b> 3 AAA  <b>MSRP:</b> Available only by prescription  <b>Strips MSRP:</b> \$1.60/strip (\$79.99/50 strips)</p>	<p><b>Trividia Health</b>  <a href="http://niprodiagnostics.com">niprodiagnostics.com</a>  1-800-803-6025</p>
	<p><b>Accu-Chek Aviva Plus</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.6 •  <b>Battery:</b> 1 CR2032  <b>MSRP:</b> \$29.99  <b>Strips MSRP:</b> \$1.60/strip (\$79.99/50 strips)</p>	 <p><b>Sidekick</b>  <b>Blood Sample Size*</b>: 1.0 •  <b>Battery:</b> Disposable meter; no need to replace battery  <b>MSRP:</b> \$19.97  <b>Strips MSRP:</b> Meter is sold with a 50-strip vial attached. New strips purchased with new meter.</p>
	<p><b>Accu-Chek Compact Plus</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 1.5 •  <b>Battery:</b> 2 AAA  <b>MSRP:</b> \$74.99  <b>Strips MSRP:</b> \$1.62/strip (\$80.99/50 strips)</p>	 <p><b>True2go</b>  (also available in retail-brand models)  <b>Blood Sample Size*</b>: 0.5 •  <b>Battery:</b> 1 CR2032  <b>MSRP:</b> \$9.99  <b>Strips MSRP:</b> 70¢/strip (\$69.99/100 strips)</p>
	<p><b>Accu-Chek Nano</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.6 •  <b>Battery:</b> 2 CR2032  <b>MSRP:</b> \$29.99  <b>Strips MSRP:</b> \$1.72/strip (\$85.99/50 strips)</p>	 <p><b>True Metrix Air Self-Monitoring Blood Glucose Meter</b>  <b>Features:</b> BT  <b>Blood Sample Size*</b>: 0.5 •  <b>Battery:</b> 1 CR2032  <b>MSRP:</b> \$24.99  <b>Strips MSRP:</b> 80¢/strip (\$39.99/50 strips)</p>
<p><b>Sanofi</b>  <a href="http://ibgstar.us">ibgstar.us</a>  1-855-424-7827</p>	<p><b>iBGStar</b>  <b>Features:</b> Unit plugs into smartphone to display results  <b>Blood Sample Size*</b>: 0.5 •  <b>Battery:</b> Rechargeable lithium polymer  <b>MSRP:</b> \$74.99 (iPhone not included)  <b>Strips MSRP:</b> \$1.30/strip (\$64.99/50 strips)</p>	 <p><b>True Metrix Self-Monitoring Blood Glucose Meter</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.5 •  <b>Battery:</b> 1 CR2032  <b>MSRP:</b> \$19.99  <b>Strips MSRP:</b> 70¢/strip (\$69.99/100 strips)</p>
<p><b>Telcare</b>  <a href="http://telcare.com">telcare.com</a>  1-877-777-4710</p>	<p><b>Telcare BGM</b>  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.8 •  <b>Battery:</b> Rechargeable lithium ion  <b>MSRP:</b> \$149.99  <b>Strips MSRP:</b> \$1.12/strip (\$55.95/50 strips)</p>	 <p><b>Trueresult</b>  (also available in retail-brand models)  <b>Features:</b>   <b>Blood Sample Size*</b>: 0.5 •  <b>Battery:</b> 1 CR2032  <b>MSRP:</b> \$13-\$18  <b>Strips MSRP:</b> 70¢/strip (\$69.99/100 strips)</p>

	<p><b>Truetrack</b> (also available in retail-brand models)</p> <p><b>Features:</b> C </p> <p><b>Blood Sample Size*</b>: 1.0 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$14.99</p> <p><b>Strips MSRP:</b> 50¢/strip (\$49.99/100 strips)</p>	<p><b>Walgreens</b> <a href="http://walgreens.com">walgreens.com</a> 1-800-925-4733</p> 	<p><b>Walgreens True Metrix</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$19.99</p> <p><b>Strips MSRP:</b> 80¢/strip (\$39.99/50 strips)</p>
<p><b>U.S. Diagnostics</b> <a href="http://usdiagnostics.com">usdiagnostics.com</a> 1-866-216-5308</p> 	<p><b>Control</b></p> <p><b>Features:</b> C </p> <p><b>Blood Sample Size*</b>: 1.0 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$9.95</p> <p><b>Strips MSRP:</b> 40¢/strip (\$19.95/50 strips)</p>		<p><b>Walgreens True Metrix Air Self-Monitoring Blood Glucose Meter</b></p> <p><b>Features:</b> BT</p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$24.99</p> <p><b>Strips MSRP:</b> 80¢/strip (\$39.99/50 strips)</p>
	<p><b>EasyGluco</b></p> <p><b>Features:</b> C</p> <p><b>Blood Sample Size*</b>: 1.5 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$9.95</p> <p><b>Strips MSRP:</b> 40¢/strip (\$19.95/50 strips)</p>		<p><b>Walgreens True2go</b></p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$9.99</p> <p><b>Strips MSRP:</b> 70¢/strip (\$69.99/100 strips)</p>
	<p><b>EasyGluco Plus</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 2 CR2032</p> <p><b>MSRP:</b> \$9.95</p> <p><b>Strips MSRP:</b> 50¢/strip (\$24.95/50 strips)</p>		<p><b>Walgreens Trueresult</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$17.99</p> <p><b>Strips MSRP:</b> 70¢/strip (\$69.99/100 strips)</p>
	<p><b>Infinity</b></p> <p><b>Features:</b> </p> <p><b>Blood Sample Size*</b>: 0.5 •</p> <p><b>Battery:</b> 2 CR2032</p> <p><b>MSRP:</b> \$9.95</p> <p><b>Strips MSRP:</b> 50¢/strip (\$24.95/50 strips)</p>		<p><b>Walgreens Truetrack</b></p> <p><b>Features:</b> C </p> <p><b>Blood Sample Size*</b>: 1.0 •</p> <p><b>Battery:</b> 1 CR2032</p> <p><b>MSRP:</b> \$14.99</p> <p><b>Strips MSRP:</b> 50¢/strip (\$49.99/100 strips)</p>

Walmart  
[reliion.com](http://reliion.com)  
1-800-631-0076



**ReliOn Confirm**  
Features:   
**Blood Sample Size\***: 0.3 •  
**Battery**: 1 CR2032  
**MSRP**: \$14.88  
**Strips MSRP**: 40¢/strip  
(\$19.98/50 strips)



**ReliOn Micro**  
**Blood Sample Size\***: 0.3 •  
**Battery**: 1 CR2032  
**MSRP**: \$14.98  
**Strips MSRP**: 40¢/strip  
(\$19.98/50 strips)



**ReliOn Prime**  
**Blood Sample Size\***: 0.5 •  
**Battery**: 1 CR2032  
**MSRP**: \$9  
**Strips MSRP**: 18¢/strip  
(\$9/50 strips)



**ReliOn Ultima**  
Features:   
**Blood Sample Size\***: 0.6 •  
**Battery**: 1 CR2032  
**MSRP**: \$14.98  
**Strips MSRP**: 36¢/strip  
(\$35.88/100 strips)

American Diabetes Association.  
**MyFoodAdvisor**

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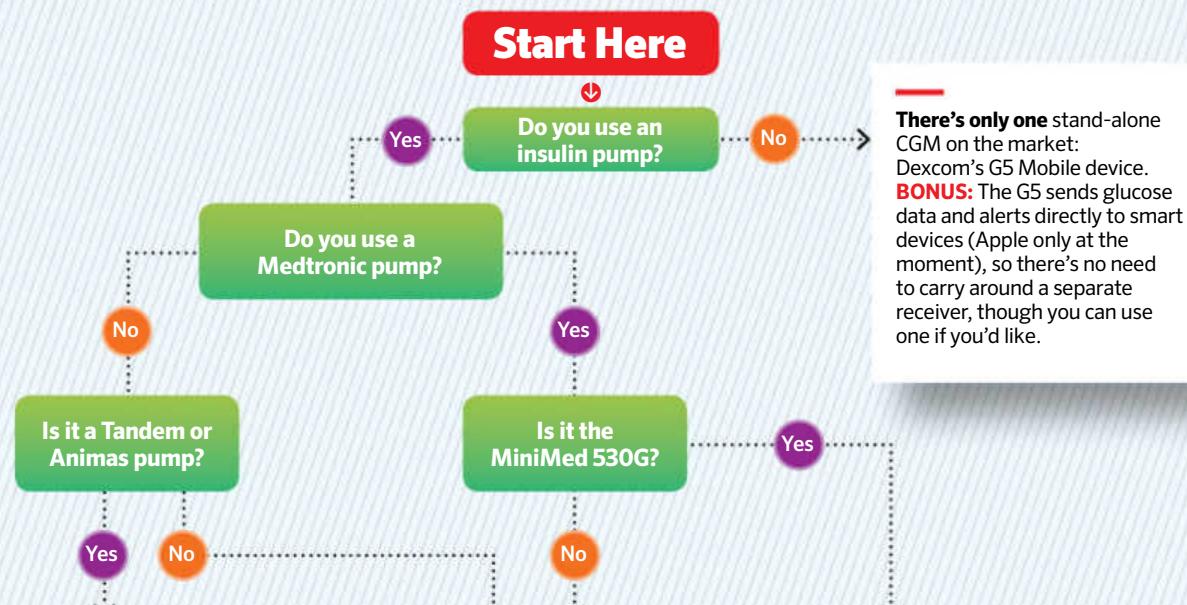
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# The Right CGM for You

There are four continuous glucose monitor (CGM) products on the market today. Which is best for you depends on a number of things—especially your insulin delivery method. That's a good place to start when shopping for a CGM.

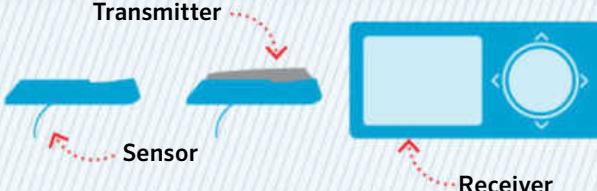


**Good News:** Both the Animas Vibe and Tandem T:slim G4 pumps have an integrated Dexcom CGM; they don't work with the newer Dexcom G5 Mobile system. **NOTE:** Other pumps by Tandem and Animas don't have an integrated CGM.

If you use a pump without an integrated CGM but still want continuous glucose readings, don't fret. You can use Dexcom's G5 Mobile system alongside any pump—but you will need to carry a receiver.

If you're using Medtronic's 530G pump, then you have a CGM—they're sold as a unit. The setup includes a pump that shows glucose readings on its screen, a glucose sensor, and CGM transmitter.

## CGM COMPONENTS



For more on the CGMs and their features, flip the page.

# Continuous Glucose Monitors

## → STAND-ALONE CONTINUOUS GLUCOSE MONITOR

Company Product	Transmitter and Sensor Size	Receiver Size	Battery	Range	Warm-Up Time	Calibration	
<b>Dexcom G5 Mobile</b> 	1.5 x 0.9 x 0.5 in. 0.4 oz. with sensor	4 x 1.8 x 0.5 in. (receiver not pictured) 2.4 oz.	Transmitter has integrated battery with a three-month warranty.  Rechargeable receiver.	The sensor/transmitter must be within 20 (unobstructed) feet of a receiver or iPhone, iPad, or iPod Touch.	Takes 2 hours to be ready after inserting sensor	Calibrate every 12 hours. Blood glucose levels must be between 40 and 400 mg/dl to calibrate.	

## → COMBINATION CONTINUOUS GLUCOSE MONITOR-INSULIN PUMPS

<b>Animas Corp. Vibe</b> 	1.5 x 0.9 x 0.5 in. 0.3 oz. with sensor	2 x 3.25 x 0.85 in. 3.7 oz. without batteries and with empty reservoir	Transmitter has integrated battery that lasts a minimum of six months. Pump uses either a AA or 1.5-volt lithium AA battery.	The sensor/transmitter must be within 12 feet of the pump.	Takes 2 hours to be ready after inserting sensor	Calibrate every 12 hours. Blood glucose levels must be between 40 and 400 mg/dl to calibrate.	
<b>Medtronic Diabetes MiniMed 530G With Enlite</b> 	1.4 x 1.12 x 0.37 in. 0.19 oz. without sensor	<b>Model 551:</b> 2 x 3.3 x 0.81 in. 3.4 oz.  <b>Model 751:</b> 2 x 3.7 x 0.82 in. 3.7 oz.  (weights for both models with battery and empty reservoir)	Rechargeable transmitter. Fully charged transmitter lasts for 14 days of continuous use. Charger uses 1 AAA battery that lasts for 40 charges. Pump uses 1 AAA battery.	The sensor/transmitter must be within 6 feet of the pump.	Takes 2 hours to be ready after inserting sensor	Calibrate every 12 hours. Blood glucose levels must be between 40 and 400 mg/dl to calibrate.	
<b>Tandem Diabetes Care T:slim G4 Pump</b> 	1.5 x 0.9 x 0.5 in. 0.3 oz. with sensor	2 x 3.13 x 0.6 in. 3.9 oz. with battery and full reservoir	Transmitter has integrated battery that lasts a minimum of six months. Pump uses an integrated rechargeable lithium polymer battery.	The sensor/transmitter must be within 20 (unobstructed) feet of the pump.	Takes 2 hours to be ready after inserting sensor	Calibrate every 12 hours. Blood glucose levels must be between 40 and 400 mg/dl to calibrate.	

Sensor Duration	Meter Interaction	Pump Functions?	Software	Details
7 days	You can manually enter a glucose reading from any meter.	No, the Dexcom G5 Mobile is a stand-alone system.	Automatically sends data to the Dexcom Clarity Web-based diabetes management software.	Users can get CGM data and alerts directly on their smart device—Apple products only at the moment, though Android compatibility is in the works. A receiver is available, but is not necessary. Built-in hypoglycemia safety alarm alerts user when glucose hits 55 mg/dl and is always on. Customizable alarms with a number of different tones alert user when glucose falls below or rises above set limits and when glucose is rising or falling rapidly. Sensor with attached transmitter is water resistant for up to 8 feet deep for 24 hours, so you can wear it while bathing and swimming. The receiver should not get wet. Pump has integrated Dexcom Share, which allows up to five caregivers to view glucose readings in real time by using Dexcom's Follow app on Apple or select Android devices. Approved for use by adults and children 2 and over.
7 days	You can manually enter a glucose reading from any meter.	Yes, the Animas Vibe functions as both an insulin pump and a CGM, using Dexcom technology.	Works with Diasend Web-based data management software.	Combines a Dexcom sensor and transmitter with the Animas Vibe insulin pump. (More on its pump functions on p. 72.) Alarms alert user when glucose is above or below set limits or when glucose is rising or falling rapidly. Sensor with attached transmitter is water resistant for up to 8 feet deep for 24 hours, so you can wear it while bathing and swimming. Pump is waterproof for up to 12 feet deep for 24 hours. Approved for use by adults and children 2 and over.
6 days	You can manually enter a glucose reading from any meter. The Contour Next Link meter wirelessly communicates with the system.	Yes, the MiniMed 530 With Enlite functions as both an insulin pump and a CGM.	Works with CareLink Personal data management software. Compatible with Windows (except Windows 8) and Mac operating systems.	Integrated diabetes management system with pump and CGM capabilities. (More on its pump functions on p. 72.) Threshold Suspend feature automatically stops insulin delivery for up to 2 hours when glucose values reach a preset low threshold and there is no response to the alarm. Alarms warn user up to 30 minutes before glucose hits upper or lower limit, when glucose is rising or falling rapidly, and when glucose reaches preset high and low values. Sensor with attached transmitter is waterproof for up to 8 feet deep for 30 minutes, so you can wear it while bathing and swimming. Pump is not watertight; remove before bathing and swimming. Approved for use by adults and children 16 and over.
7 days	You can manually enter a glucose reading from any meter.	Yes, the Tandem T:slim G4 Pump functions as both an insulin pump and a CGM, using Dexcom technology.	Works with T:Connect Diabetes Management Application, Tandem's Web-based software that is compatible with both Windows and Mac operating systems. Also works with Diasend Web-based glucose data management software.	Combines a Dexcom sensor and transmitter with the Tandem T:slim G4 insulin pump. (More on its pump functions on p. 74.) Alarms alert user when glucose is above or below a set target range or when glucose is rising or falling rapidly. Sensor with attached transmitter is water resistant for up to 8 feet deep for 24 hours, so you can wear it while bathing and swimming. Pump is watertight for up to 3 feet deep for 30 minutes. Approved for use by adults and children 12 and over.

# Go Ahead, Pick Your Pump

To find an insulin pump that'll suit you best, it's a good idea to do more than browse a brochure, call the first pump sales representative you're referred to, or blindly order the pump your friend or health care provider uses. Given that most people stay with an insulin pump for the length of its warranty (about four or five years), it's best to treat the devices as long-lasting, big-ticket items. Not only that, but each pump has its own set of advantages and drawbacks. That's why it's important to look at the complete package when comparing devices.

But keep in mind: It is unlikely that you will find one pump that is perfectly suited to all of your wants and needs. Just like choosing a house or a car, selecting a pump requires you to take some of the bad with (hopefully) a lot of the good. The key is to find a device that meets most of your important needs, with minimal drawbacks on features that are relevant to you.

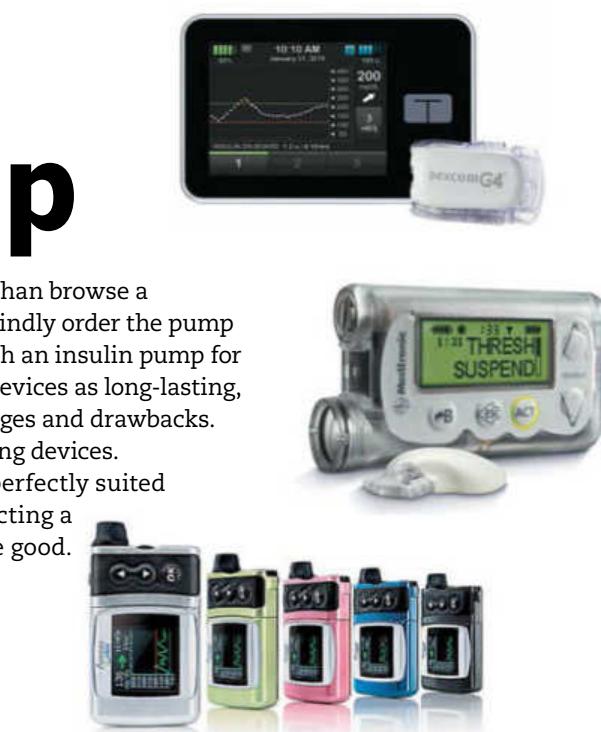
## Start Here

Before you can find a pump that meets your most pressing needs, you have to know what you're looking for. There are several key features that just about everyone should consider when selecting a pump. These include:

### TUBING

 There are two ways to wear a pump: directly on the skin or with the device linked to your skin via flexible tubing. Devices with tubing to connect the pump to the body generally offer full programming on the pump itself, a choice of infusion set types, and the opportunity to disconnect from the pump at the infusion site. The tangle factor of the tubing causes some people to prefer pods or patch pumps. A "patch" or "pod" pump stays stuck to you until you change it for a new one.

The OmniPod, the only programmable tubing-free pump on the market, offers several advantages: It's discreet (small enough to hide under clothing), disposable, inserts its own cannula automatically, and eliminates the catching and pulling hassles associated with tubing. Because there's no tube to fill,



the pod doesn't waste as much insulin. And because it stays on the body continuously, the pod doesn't cause gaps in insulin delivery due to disconnection. Another bonus: There's no unwanted movement of insulin when the pump is raised or lowered—something that can occur when using tubing, giving you a small amount of extra insulin when the pump is raised and a bit less than intended when it's lowered. On the downside, use of a pod-type pump requires a separate remote control for all programming, and any skin- or insertion site-related issues require complete pod replacement.

### RESERVOIR VOLUME

 Most pump users benefit from a device that holds enough insulin for at least three days, plus an extra 20 to 30 units for priming the tubing. If you use less than 60 units (basal and bolus total, or total daily dose) each day, reservoir size isn't an issue—reservoirs need to be only partially filled. But if you're insulin resistant or require more than 60 units per day, look for a pump that holds at least 300 units. One pump, Tandem's T:flex, holds up to 480 units.

### Easy Does It

Some pumps are simply easier to learn and faster to program than others. Touch-screen technology can help, as can menu-based programming. Be sure to play around. You might find, for instance, that a pump's lack of a "back" button makes navigation difficult.

## OUT-OF-POCKET COST

 Although health insurance usually covers the cost of insulin pumps and disposable supplies, there are often copays and deductibles that must be met. The up-front cost of the OmniPod is approximately 80 to 90 percent less than that of a traditional tubed pump, but the long-term costs can be higher given the higher price for the disposable pods. And keep in mind: Some health plans (including Medicare) don't cover the OmniPod. If you're looking to save out of pocket, check out the Roche Accu-Chek Combo, which costs about 20 percent less than other tubed pumps.

## FLEXIBLE DOSING

 An insulin-to-carb ratio will tell you how many grams of carbohydrate a single unit of insulin covers. The ability to calculate bolus doses using insulin-to-carb ratios in tenths of a gram is important for people who require large doses (where each unit of insulin covers 6 grams of carb or fewer). For example, 1 unit of insulin for every 3.5 grams of carb may be needed if 1 unit for every 3 grams is too much but 1 unit for every 4 grams is too little. If that's you, check out pumps by Tandem, Medtronic, and Roche. Tandem also permits bolus doses as high as 60 units with its T:flex model.

Some pumps allow users to specify a time representing insulin duration—how long after bolus delivery insulin remains active and available in the body. Insulin duration affects calculations of insulin on board, a fancy pump term for the insulin still active in the body after a bolus delivery. Tandem pumps allow insulin duration to be set to the nearest minute while Medtronic pumps allow duration to be set in 30-minute increments.

Tandem pumps also permit the greatest flexibility when setting temporary basal rates, with increases of up to 250 percent for up to 72 hours. They also allow users to set up secondary programs (called "profiles") with unique basal and bolus settings combined into the same program. Doing so

## INSULIN DELIVERY FOR TYPE 2s

**Company:** Valeritas **Device:** V-Go

**Size and Weight:** 2.4 x 1.3 x 0.5 in.

0.7 to 1.8 oz. filled, depending on units of insulin used

**Reservoir:** V-Go 20: 20 units basal over 24 hours; 36 units bolus in 2-unit increments; 56 units total;

**V-Go 30:** 30 units basal over 24 hours; 36 units bolus in 2-unit increments; 66 units total; **V-Go 40:** 40 units basal over 24 hours; 36 units bolus in 2-unit increments; 76 units total

**Infusion Set:** Does not use tubing. Comes with a built-in, 30-gauge, pivoting stainless steel needle with a 90° insertion angle.

**Battery:** No battery; uses mechanical power source

**Food Database?** N/A

**Meter Interaction?** N/A

**CGM Interaction?** N/A

**Details:** Specifically designed for use by adults with type 2 diabetes. Unlike other devices, the V-Go delivers bolus insulin with button presses, not electronics. Each disposable device is used for 24 hours, after which time users attach a new V-Go. Device may be submerged to a depth of 3 feet, 3 inches, for 24 hours, so there's no need to remove the patch while swimming or bathing. Does not work with data management software.



can help users tailor insulin doses during times when they're more or less sensitive to insulin—say, when they're sick, stressed out, or exercising more or less than usual. Other pumps allow secondary basal programs, but not secondary bolus programs.

## SMALL DOSES

 People who are extremely sensitive to insulin and require doses of less than 1 unit may value pumps that allow basal and bolus dosing in the smallest possible increments. Tandem pumps offer basal dosing in increments of 0.001 units and

# Insulin Pumps

## Reporting In

Pay attention to a pump's data management software. Some are able to integrate data from other devices (such as CGMs and meters) while others cannot. Many are compatible with both Mac and Windows systems, but not all (and not all work with Windows 8). Talk with your health care provider about how meaningful the software's generated reports are as well as how easy they are to interpret.

## Listen Up

The level at which a pump sounds alarms is important, especially if you're hard of hearing or spend a lot of time in loud environments. Take prospective pumps for a test drive and pay attention to how loud they sound and how strongly they vibrate.

boluses in increments of 0.01 units. Both Animas and Medtronic offer pumps with basal dosing in 0.025-unit increments, and Medtronic pumps allow for boluses in increments of 0.025 units.

## WATERTIGHT EXTERIOR



If you spend a fair amount of time in or around water, you may want to consider a pump that will not be easily damaged by splashing or submersion. Animas' pumps are truly watertight—and warranted as such. The OmniPod and Accu-Chek Combo are watertight, but their remote controls are not. Tandem pumps are semi-watertight, but only up to 3 feet for 30 minutes (and the charging compartment cover tends to come lose easily, which can lead to water damage if submerged). Medtronic pumps are not watertight.

## CGM INTEGRATION



Some pumps eliminate the need to carry a separate CGM receiver by displaying sensor data on the pump screen. The MiniMed 530G has a built-in Medtronic CGM display while the Animas Vibe and Tandem T:slim G4 both have Dexcom CGM integration.

### KEEP IN MIND

All pumps are well-built and well-supported devices that have a set of core features in common and should serve you well. So if you've thoroughly compared devices and still can't decide among them, go with the one you're most comfortable with. Worst-case scenario: If you find that you made the wrong choice after you start using the pump, you can return it. Most pump manufacturers offer a 30-day (or longer) money-back guarantee. Check with them when making your purchase to find out the terms.

## APPEARANCE MATTERS

Nobody wants to walk around looking like a medical cyborg. (Hey, we're human!) Luckily, several of today's pumps feature a high degree of discretion—and earn major cool points. As a tubeless patch device, the OmniPod is by far the smallest of all pumps. Tandem pumps are the slimmest and smallest of all tubed pumps. Pumps that can be programmed via remote control (including the OmniPod, Accu-Chek Combo, and OneTouch Ping) allow for the utmost discretion. Of course, you'll have to weigh the benefit of using a remote control against the drawback of having to carry an extra device around. From a style standpoint, most pumps can be ordered in a variety of colors or with stylish cases.

## METER INTERACTION



Some pumps accept data transmissions from blood glucose meters. This eliminates the need to manually enter blood glucose values into a pump's bolus calculator and ensures that the correct reading is always entered. Medtronic pumps link with Bayer Contour Next Link, OneTouch UltraLink, and NovaMax Link meters. A handful of pumps have meters integrated into the remote controls that program the pump: The Animas Ping (but not the Animas Vibe) has a OneTouch Ping meter remote, the Accu-Chek Combo's remote has an Accu-Chek Combo meter, and the OmniPod has a built-in FreeStyle meter.

## INSULIN SUSPENSION



A pump's ability to take readings from a CGM and automatically adjust insulin delivery is considered the next great step in diabetes management. Although

still in its infancy, the first commercial step toward an artificial pancreas exists in Medtronic's MiniMed 530G pump. This pump automatically responds to low glucose by suspending basal insulin delivery for up to two hours when low glucose alarms are

ignored. Although not intended as a treatment for hypoglycemia (rapid-acting carbohydrate will raise the blood glucose much faster), this feature can provide an extra level of safety and security for those who are susceptible to severe lows.

Learn more about all of the pumps mentioned here by flipping to our chart of available insulin pumps on page 72.

## Continue On

You've read about pump features. The next step: Compare pumps against one another to find out which rate highest on those particular features. You can do that in one of two ways—check them out below.

### 1. SCAN THE LIST

You've read about the top features and learned which pumps offer them. Now find out more about those pumps by flipping to the chart on page 72. We've listed the important data and specs for easy viewing. Scan for our handy icons to find pumps with your favorite features.

### 2. RUN THE NUMBERS

If you're not put off by a little bit of math, a good approach to pump comparison is to do a weighted evaluation.

**STEP 1:** Choose the two or three features that are most important to you and assign them an "importance score" from 1 to 5, with 1 being "not at all important" and 5 being "can't live without it."

**STEP 2:** On a scale of 1 to 5, rate how well each pump meets your needs with those features.

**STEP 3:** Multiply your importance scores by your ratings. Those are your weighted scores.

**STEP 4:** Add a pump's weighted scores for all features to get your total score.

For example, let's say you place extremely high importance on cost. It might deserve a score of 5. Your second most-important feature might be the size of the reservoir, which may earn it an importance score of 4. Third, you may place modest importance on whether the pump is watertight or not, awarding that feature an importance score of 2.

Next, consider all of your pump options, rating each on the cost, size of the reservoir, and watertightness. Add up each pump's weighted scores (see Step 3, above) to get their total scores. The pump with the highest total score ranks best when considering all three of your top features.

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### SAMPLE PUMP EVALUATION

FEATURE	PUMP A	PUMP B
<b>Cost</b> Importance: 5	Rating: 5 Weighted score: 25	Rating: 3 Weighted score: 15
<b>Reservoir Size</b> Importance: 4	Rating: 1 Weighted score: 4	Rating: 5 Weighted score: 20
<b>Watertight</b> Importance: 2	Rating: 3 Weighted score: 6	Rating: 4 Weighted score: 8
<b>TOTAL</b>	<b>35</b>	<b>43</b>

# Insulin Pumps

Company Insulin Pump	Features	Size and Weight	Battery	Reservoir	Infusion Set
<b>Animas Corp. OneTouch Ping</b>  	✖️ ! 🔍	<b>Pump:</b> 3.25 x 2 x 0.86 in. 3.74 oz. with battery and empty reservoir  <b>Meter remote:</b> 3.8 x 2.46 x 1.12 in. 3.88 oz. with batteries	<b>Pump:</b> (1) 1.5-volt lithium AA or (1) 1.5-volt alkaline AA  <b>Meter remote:</b> (2) 1.5-volt alkaline AAA	200-unit cartridge	Compatible with all standard Luer-lock infusion sets
<b>Animas Corp. Vibe</b>  	✖️ ! 🔍	3.25 x 2 x 0.86 in. 3.7 oz. without batteries and with empty reservoir	(1) 1.5-volt lithium AA or (1) 1.5-volt alkaline AA	200-unit cartridge	Compatible with all standard Luer-lock infusion sets
<b>Insulet Corp. OmniPod</b>  	✖️ ⚡ 🔍	<b>Pod:</b> 1.53 x 2.05 x 0.57 in. 0.88 oz. with empty reservoir  <b>Personal Diabetes Manager (PDM):</b> 2.4 x 4.4 x 0.98 in. 4.4 oz. with batteries	<b>Pod:</b> battery integrated  <b>PDM:</b> 2 AAA	Pod includes built-in reservoir that holds 200 units.	Does not use tubing. Pod comes with a built-in cannula and insertion device.
<b>Medtronic Diabetes MiniMed 530G With Enlite</b>  	❗️ ⚡ ⏱️ 🔍	<b>Model 551:</b> 2 x 3.3 x 0.81 in. 3.4 oz. with battery and empty reservoir  <b>Model 751:</b> 2 x 3.7 x 0.82 in. 3.7 oz. with battery and empty reservoir	1 AAA	<b>Model 551:</b> 180-unit reservoir  <b>Model 751:</b> 300-unit reservoir	Compatible with Medtronic infusion sets only
<b>Medtronic Diabetes MiniMed Paradigm Revel</b>  	❗️ ⚡ ⏱️ 🔍	<b>Model 523:</b> 2 x 3.3 x 0.82 in. 3.4 oz. with battery and empty reservoir  <b>Model 723:</b> 2 x 3.7 x 0.84 in. 3.6 oz. with battery and empty reservoir	1 AAA	<b>Model 523:</b> 180-unit reservoir  <b>Model 723:</b> 300-unit reservoir	Compatible with Medtronic infusion sets only

Basal Range	Bolus Range	Food Database?	Details
From 0.025 to 25 units per hour in 0.025-unit increments	0.05 to 35 units in 0.05-unit increments. Insulin-to-carb ratio in whole units only.	Yes, meter remote stores up to 500 foods and their nutrition information. Added software allows users to customize food database.	Meter remote and pump can each control nearly all pump functions, including delivering a bolus, monitoring pump stats, and confirming alarms and warnings. Meter remote works from up to 10 feet away. Pump is waterproof for up to 12 feet deep for 24 hours, so there's no need to disconnect while swimming or bathing. Eight pump and eight meter remote "skins" are available to customize. Works with ezManager Max data management software, which is compatible with Windows (except Windows 7 and 8) and Mac operating systems. Pump also works with Diasend Web-based data management software.
From 0.025 to 25 units per hour in 0.025-unit increments	From 0.05 to 35 units in 0.05-unit increments. Insulin-to-carb ratio in whole units only.	Yes, pump stores up to 500 foods and their nutrition information.	The Vibe is a pump with built-in CGM technology that uses a sensor to wirelessly transmit continuous glucose readings. (More on its CGM functions on p. 62.) Pump is waterproof for up to 12 feet deep for 24 hours, so there's no need to disconnect while swimming or bathing. Eight pump "skins" are available to customize. Works with Diasend Web-based data management software.
From 0.05 to 30 units per hour in 0.05-unit increments	From 0.05 to 30 units. Increments of 0.05, 0.1, 0.5, or 1 unit. Insulin-to-carb ratio in whole units only.	Yes, PDM contains more than 1,000 common foods (with nutrition information) and stores up to 36 preset carb values.	No tubing required: System includes a pod that's worn for up to 72 hours and a PDM that controls the pod's functions (you can't control the pod without the PDM). Pod is waterproof for up to 25 feet deep for 60 minutes, so there's no need to disconnect while swimming or bathing. Seven "skins" are available for PDM personalization. Works with Abbott's CoPilot data management software. Software is compatible with Windows (except Windows 8), but is not Mac compatible. PDM is compatible with Glooko data management system and NuMedics' online Diabetes Partner data management tool.
From 0.025 to 35 units per hour in 0.025-unit increments for up to 0.975 units. Increments of 0.05 units for between 1 and 9.95 units. Increments of 0.1 units for 10 units or more.	From 0.025 to 25 units. Increments of 0.025 units up to 0.975 units. Increments of 0.05 units for 0.975 units or more. Insulin-to-carb ratio allows for fractions of grams.	No	The MiniMed 530G combo meter-CGM, is the first FDA-approved device with Threshold Suspend technology. This feature stops insulin delivery for up to 2 hours if the blood glucose level reaches a preset low limit and the user doesn't react to a low-glucose alarm. (More on its CGM functions on p. 62.) Remove pump body before bathing, swimming, or other water activities. Works with CareLink Personal software to upload and manage pump and CGM data. Compatible with Windows (except Windows 8) and Mac operating systems. Pump also works with MiniMed Connect, which allows pump and CGM data to be displayed via an app on an iPhone or iPod Touch. MiniMed Connect can also text updates to family and friends. Not approved for use in children under 16.
From 0.025 to 35 units per hour in 0.025-unit increments for up to 0.975 units. Increments of 0.05 units for between 1 and 9.95 units. Increments of 0.1 units for 10 units or more.	From 0.025 to 25 units. Increments of 0.025 units up to 0.975 units. Increments of 0.05 units for 0.975 units or more. Insulin-to-carb ratio allows for fractions of grams.	No	Though formerly a combo pump-CGM, the MiniMed Revel is now a stand-alone pump. Has remote-control capabilities. Remove pump body before bathing, swimming, or other water activities. Pump comes in five different colors, and "skins" are available to customize. Works with CareLink Personal software to upload and manage pump and CGM data. Compatible with Windows (except Windows 8) and Mac operating systems. Pump also works with MiniMed Connect, which allows data to be displayed via an app on an iPhone or iPod Touch. MiniMed Connect can also text updates to family and friends.

# Insulin Pumps

Company Insulin Pump	Features	Size and Weight	Battery	Reservoir	Infusion Set
<b>Roche Insulin Delivery Systems Accu-Chek Combo</b>		<p><b>Pump:</b> 3.2 x 2.2 x 0.8 in. 3.9 oz. with battery and full reservoir</p> <p><b>Meter remote:</b> 3.7 x 2.2 x 1 in. 3.6 oz. with batteries</p>	<p><b>Pump:</b> (1) AA lithium, alkaline, or rechargeable</p> <p><b>Meter remote:</b> (3) AAA alkaline</p>	315-unit cartridge	Compatible with all standard Luer-lock infusion sets
<b>Sooil Development Dana Diabecare IIS</b>		<p>3.07 x 1.81 x 0.78 in. 2.29 oz. with battery and full reservoir</p>	(1) 3.6-volt DC lithium	300-unit cartridge	Compatible with Sooil infusion sets only
<b>Tandem Diabetes Care T:flex Pump</b>		<p>3.13 x 2 x 0.84 in. 4.05 oz. with battery and full reservoir</p>	Rechargeable lithium polymer battery	480-unit cartridge	Compatible with all standard Luer-lock infusion sets
<b>Tandem Diabetes Care T:slim Pump</b>		<p>3.13 x 2 x 0.6 in. 3.95 oz. with battery and full reservoir</p>	Rechargeable lithium polymer battery	300-unit cartridge	Compatible with all standard Luer-lock infusion sets
<b>Tandem Diabetes Care T:slim G4 Pump</b>	 	<p>3.13 x 2 x 0.6 in. 3.95 oz. with battery and full reservoir</p>	Rechargeable lithium polymer battery	300-unit cartridge	Compatible with all standard Luer-lock infusion sets

	<b>Basal Range</b>	<b>Bolus Range</b>	<b>Food Database?</b>	<b>Details</b>
	From 0.05 to 25 units per hour. Delivers in 0.01-unit increments for up to 1 unit per hour, in 0.05-unit increments for up to 10 units per hour, and in 0.1-unit increments for up to 25 units per hour.	From 0.1 to 25 units in increments of 0.1, 0.2, 0.5, 1, and 2 units for standard boluses. Extended and Multiwave boluses are adjustable in increments of 0.1 units. Insulin-to-carb ratio allows for fractions of grams.	No	Meter remote and pump can each control nearly all pump functions, including delivering a bolus, monitoring pump stats, and confirming alarms and warnings. Meter screen displays graphs and data in full color. Meter remote works from about 6 feet away. Pump is watertight for up to 8 feet for 1 hour, though disconnecting is recommended for bathing, swimming, and other water activities. Works with Accu-Chek 360° software, insulin pump configuration software, and Smart Pix device reader for data management. Software and reader are compatible with Windows (except Windows 8; only 360° software works with Windows 7) but are not Mac compatible.
	From 0.1 to 16 units per hour in 0.1-unit increments	From 0.1 to 10 units in 0.1-unit increments. From 10 to 87 units in 1-unit increments. Insulin-to-carb ratio in whole units only.	No	Menu uses icons instead of words. Available in a choice of five colors. Does not work with data management software.
	From 0.5 to 15 units per hour in 0.001-unit increments	From 0.5 to 60 units in 0.01-unit increments. Insulin-to-carb ratio allows for fractions of grams.	No	Largest-capacity insulin pump designed for people who require more than 100 units of insulin per day. Maximum bolus of 60 units. Color touch screen. Micro-delivery technology allows for a thinner pump. Rechargeable battery with micro USB. Pump is watertight for up to 3 feet deep for 30 minutes. Works with T:Connect Diabetes Management Application, Tandem's Web-based software that is compatible with both Windows and Mac operating systems. Also works with Diasend, a Web-based glucose data management software. May be used by children 12 and over.
	From 0.1 to 15 units per hour in 0.001-unit increments	From 0.05 to 25 units in 0.01-unit increments with an option for up to an additional 25 units. Insulin-to-carb ratio allows for fractions of grams.	No	Color touch screen. Flat reservoir design and micro-delivery technology allow for a thinner pump. Rechargeable battery with micro USB. Delivers smallest basal insulin increments available. Pump is watertight for up to 3 feet deep for 30 minutes. Works with T:Connect Diabetes Management Application, Tandem's Web-based software that is compatible with both Windows and Mac operating systems. Also works with Diasend, a Web-based glucose data management software. May be used by children 12 and over.
	From 0.1 to 15 units per hour in 0.001-unit increments	From 0.05 to 25 units in 0.01-unit increments with an option for up to an additional 25 units. Insulin-to-carb ratio allows for fractions of grams.	No	The T:slim G4 is a pump with built-in CGM technology that uses a sensor to wirelessly transmit continuous glucose readings. (More on its CGM functions on p. 62.) Color touch screen. Flat reservoir design and micro-delivery technology allow for a thinner pump. Rechargeable battery with micro USB. Delivers smallest basal insulin increments available. Pump is watertight for up to 3 feet deep for 30 minutes. Works with T:Connect Diabetes Management Application, Tandem's Web-based software that is compatible with both Windows and Mac operating systems. Also works with Diasend, a Web-based glucose data management software. May be used by children 12 and over.

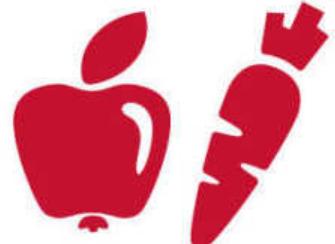
 American Diabetes Association.  
**Living With Type 2 Diabetes**



Living With Type 2 Diabetes is a free, 12-month program that offers information and support to people newly diagnosed with type 2 diabetes. Program members receive four packets throughout the year with information, tools and recipes.

## **PACKET 1**

Food, nutrition, and healthy choices



## **PACKET 2**

Emotional health and diabetes management



## **PACKET 3**

Types of physical activity



## **PACKET 4**

Resources on support, discrimination, and financial burden



**ENROLL TODAY: Visit [diabetes.org/type2](http://diabetes.org/type2)  
or call 1-800-DIABETES (342-2383)**

# Ready, Sets

Infusion sets are more than flimsy plastic—they're instrumental in getting insulin from your pump into your body

## This Inserts the Needle

With the press of a button, an insertion device injects an infusion set needle or cannula under the skin. With manually inserted infusion sets, you will slide the needle under your skin, then press down the adhesive pad to hold it in place.



## This Brings Insulin to Your Body

The tubing length you choose depends a lot on your size. But where you wear your pump matters, too. If you clip your pump to your waistband, you may need a different length of tubing to connect to an infusion set on your abdomen versus your buttock.

## THIS IS HOW YOU DISCONNECT

Chances are, you'll sometimes want to disconnect from your pump without removing (and then trashing) your infusion set needle or cannula—perhaps to bathe, for example. Tubing that detaches “at the site” disconnects close to the adhesive pad that holds the infusion set in place. When disconnected, all that remains is the needle or cannula, adhesive, and (sometimes) a short tail of tubing. Infusion sets that disconnect “away from the site” detach further from the insertion site, leaving a longer tail of tubing behind.



## This Goes Under Your Skin

To deliver insulin beneath your skin, an infusion set will use either a stainless steel needle or an introducer needle that's removed and leaves a flexible cannula under the skin. From there, the three big factors you'll want to consider are needle angle, gauge (the higher the number, the thinner the needle), and length.



## This Connects to Your Pump

Pumps with Luer-lock connectors are compatible with Luer lock-capable sets—and those are in the majority. Select pumps, however, work only with the manufacturer's specific brand of infusion set.

# Infusion Sets

Company	Infusion Set	Connection	Insertion Angle/Needle and Cannula Thickness, Type, and Length	Tubing Length/Disconnect*	Insertion
Animas Corp.	Comfort	Compatible with all Luer-lock pumps	20° to 45° insertion angle; 27-gauge plastic cannula; 13- and 17-mm cannula lengths	23, 31, and 43 in.; at site	Manual
	Contact Detach		90° insertion angle; 29-gauge stainless steel needle; 6- and 8-mm needle lengths	23 and 43 in.; away from site	
	Inset		90° insertion angle; 27-gauge plastic cannula; 6- and 9-mm cannula lengths	23 and 43 in.; at site	Via built-in disposable insertion device
	Inset 30		30° insertion angle; 27-gauge plastic cannula; 13-mm cannula length		
Medtronic Diabetes	Mio	Compatible with Medtronic pumps only	90° insertion angle; 27-gauge plastic cannula; 6- and 9-mm cannula lengths	18, 23, and 32 in.; at site	Manual or via built-in disposable insertion device
	Quick-Set	Compatible with all Luer-lock pumps and Medtronic pumps	30° to 45° insertion angle; 27-gauge plastic cannula; 13- and 17-mm cannula lengths	18, 23, 32, and 43 in.; at site	Manual or via Quick-Serter insertion device
	Silhouette				Manual or via Sil-Serter insertion device
	Sure-T	Compatible with Medtronic pumps only	90° insertion angle; 29-gauge stainless steel needle; 6-, 8-, and 10-mm needle lengths		Manual
Roche Insulin Delivery Systems	Accu-Chek Rapid-D	Compatible with all Luer-lock pumps	90° insertion angle; 28-gauge stainless steel needle; 6-, 8-, and 10-mm needle lengths	24, 31, and 43 in.; away from site	Manual
	Accu-Chek Tender		20° to 45° insertion angle; 25-gauge silicone cannula; 13- and 17-mm cannula lengths	24, 31, and 43 in.; at site	
	Ultraflex		90° insertion angle; 25-gauge silicone cannula; 6-, 8-, and 10-mm cannula lengths		Manual or via Accu-Chek LinkAssist insertion device
Sooil Development	Easy Release and Easy Release II	Compatible with Sooil pumps only	90° insertion angle; 27-gauge stainless steel needle; 7- and 9-mm needle lengths	28 and 43 in.; away from site	Manual
	Soft-Release-O		90° insertion angle; 24-gauge plastic cannula; 6- and 9-mm cannula lengths	12, 24, 31, and 40 in.; at site	
	Soft-Release-ST		15° to 30° insertion angle; 24-gauge polyurethane cannula; 19-mm cannula length	28 and 43 in.; at site	

\*At site: Tubing disconnects at the infusion site, leaving the needle or cannula and adhesive in place.

Away from site: Tubing disconnects a few inches away from the infusion site; the needle or cannula, adhesive, and a short tail of tubing remain.

Company	Infusion Set	Connection	Insertion Angle/Needle and Cannula Thickness, Type, and Length	Tubing Length/Disconnect*	Insertion
<b>Tandem Diabetes Care</b>	<b>Cleo 90</b>	Compatible with all Luer-lock pumps	90° insertion angle; 25-gauge plastic cannula; 6- and 9-mm cannula lengths	24, 31, and 42 in.; at site	Via built-in disposable insertion device
	<b>Comfort</b>		20° to 45° insertion angle; 27-gauge plastic cannula; 13- and 17-mm cannula lengths	23 and 43 in.; at site	Manual
	<b>Contact Detach</b>		90° insertion angle; 29-gauge stainless steel needle; 6- and 8-mm needle lengths	23 and 32 in.; away from site	
	<b>T:90</b>		90° insertion angle; 27-gauge plastic cannula; 6- and 9-mm cannula lengths	23 and 43 in.; at site	Via built-in disposable insertion device
	<b>T:30</b>		30° insertion angle; 27-gauge plastic cannula; 13-mm cannula length		

\*At site: Tubing disconnects at the infusion site, leaving the needle or cannula and adhesive in place.

Away from site: Tubing disconnects a few inches away from the infusion site; the needle or cannula, adhesive, and a short tail of tubing remain.

● By Laurel Messer, RN, MPH, CDE

# Set for the Future

With the artificial pancreas on the horizon, today's infusion sets are ready for a refresh

**A**s diabetes technology evolves toward an eventual artificial pancreas, we're learning more about the sophisticated algorithms needed to integrate insulin pumps with continuous glucose monitors (CGMs). We hear about cutting-edge glucose sensors and even new insulin pump platforms designed for ease of use.

When was the last time you heard anything exciting about insulin infusion sets? They are akin to the floppy disk of artificial pancreas systems—a technology suited to past insulin pump needs that have long been outdated. They are also the workhorses of insulin pump therapy, slipping under the skin and delivering variable amounts of insulin without causing a major bodily riot: inflammation, infection, or rejection.



Yet despite all of that, infusion sets may be the least-studied aspect of the artificial pancreas pathway. How must they evolve in order to accommodate an artificial pancreas? Future infusion set designs need to address three major concerns:

## DAYS OF WEAR

Current infusion sets have short lifespans (about two to three days) for a number of reasons: Flexible plastic cannulas, the alternative to stainless steel needles, are prone to bend or kink under the skin. Plus, needles and cannulas may become clogged by clumps of cells or insulin, blocking insulin flow. Another concern is that the



## How about microneedles, eyelash-sized spines that deliver insulin to surface skin layers that absorb it fast?

tissue surrounding the infusion set has a reduced ability to absorb insulin after several days of use. This causes higher blood glucose levels—even when taking the correct doses of insulin. What's more, wearing an infusion set for longer than recommended ups the risk of infection. An infection, which can lead to pain, itching, swelling, and even an abscess if left untreated, can make an insertion site useless.

Because CGM sensors can be worn for six to seven days before replacement, infusion sets need to last longer as well. One approach to making them last longer: a novel infusion set in development by Becton, Dickinson, and Co. that utilizes "BD FlowSmart" technology (for more on that, flip to p. 43). This flexible infusion set has an additional hole in the side of the cannula to help reduce clogging by offering a secondary exit for insulin to get into the tissue. More clinical data is needed to see if the new technology allows users to wear infusion sets for longer periods of time.

There are other approaches as well. Some companies have explored reducing insertion site infections by coating the cannula with antimicrobial compounds. Still others have employed additives such as hyaluronidase to try to increase set wear time, but so far this has only proven to make insulin work faster (which it's intended to do).

### ALL-IN-ONE DEVICE

For years, both manufacturers and people with diabetes have envisioned a combined CGM sensor and infusion set. The inherent roadblock is the disparity in wear lengths: How do you incorporate a three-day infusion set with a seven-day sensor? The Duo system from Medtronic (available only in Europe) consolidates the infusion set and glucose sensor into the same site on the skin—with two insertions only millimeters apart. Although this means there's just one technology hub on the skin, it requires that both the sensor and infusion set be changed after three days.

### LACK OF INNOVATION

Infusion sets of the future might not resemble the past—and that's okay. For infusion sets to work with artificial pancreas systems, device designers may need to think beyond the current paradigm. How about microneedles, eyelash-sized spines that deliver insulin to surface skin layers that absorb faster than deeper layers? What about skin sensors that tell you when to change an infusion set? How about a system that would automatically change your insulin doses over the life of an infusion set based on day-to-day insulin absorption?

I believe these innovations are the future of insulin infusion and the artificial pancreas. Until then, working with your diabetes educator on optimal site selection, site rotation, and set type is crucial for pumping success. Yet it is exciting to think beyond the floppy disk, don't you think?

**Laurel Messer, RN, MPH, CDE,** is a certified diabetes educator and clinical research nurse at the Barbara Davis Center for Diabetes. She has been working with children and adults with type 1 diabetes for over 10 years and currently manages pediatric artificial pancreas research trials.

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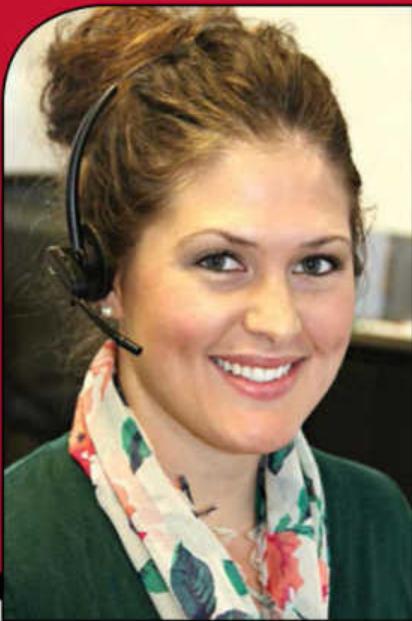
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**AskADA@diabetes.org • Preguntas@diabetes.org**

# Pen Pals

With these devices, your next insulin dose is just a click away

Insulin pens can make giving yourself medication easier because they are an insulin storage and delivery system in a single package. "Pens are more expensive than the vials, but the pens will also last a lot longer [before expiring], and 90 percent of the time they're covered under all plans," says Heather Free, PharmD, a practicing pharmacist in Washington, D.C., and spokeswoman for the American Pharmacists Association. "They're more efficient, they're more user friendly, and they encourage patients to do more for adherence."

## Should I Stay or Should I Go?

With a disposable pen, a set amount of insulin comes in the pen ready to use. When you use up the insulin inside, pitch the pen and get a new one. With a reusable pen, keep the pen itself while refilling it with easy-to-load, premeasured cartridges of insulin. Before first use, insulin pens or cartridges should be stored in the refrigerator. After that, they can be stored at room temperature.

**More** ↗



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<b>Eli Lilly HUMAPEN LUXURA HD</b> Reusable	<b>Eli Lilly HUMALOG KWIKPEN</b> Disposable	<b>Eli Lilly HUMULIN KWIKPEN</b> Disposable	<b>Novo Nordisk NOVOLOG FLEXPEN</b> Disposable	<b>Novo Nordisk FLEXTOUCH</b> Disposable
<b>Insulin</b> Humalog	<b>Insulins</b> Humalog U-100 Humalog U-200 Humalog Mix 75/25 Humalog Mix 50/50	<b>Insulins</b> Humulin N Humulin 70/30	<b>Insulins</b> NovoLog NovoLog Mix 70/30	<b>Insulins</b> Levemir <b>Tresiba</b> <i>New!</i>
<b>Dose Delivery</b> Half-unit increments, up to 30 units at a time	<b>Dose Delivery</b> One-unit increments, up to 60 units at a time	<b>Dose Delivery</b> One-unit increments, up to 60 units at a time	<b>Dose Delivery</b> One-unit increments, up to 60 units at a time	<b>Dose Delivery</b> One-unit increments, up to 80 units at a time
<b>Total Capacity</b> 300 units	<b>Total Capacity</b> For all except U-200: 300 units. For U-200: 600 units	<b>Total Capacity</b> 300 units	<b>Total Capacity</b> 300 units	<b>Total Capacity</b> 300 units
<b>Details</b> Can dispense half units of insulin for small, precise doses. Pen is green and made of metal.	<b>Details</b> Pen is blue, with different color labels for various types of insulin.	<b>Details</b> Pen is beige, with different color labels and dosing knobs for various types of insulin.	<b>Details</b> Pen is blue, with different color labels, cartridge holders, and dosing knobs for various types of insulin. Dial returns to "0" after injection to indicate delivery.	<b>Details</b> Pen comes in different colors for various types of insulin. Spring- loaded mechanism requires less force to deliver a dose. An audible click indicates insulin was delivered.
<b>Needle Compatibility</b> Becton, Dickinson, and Co. (BD) pen needles are recommended.	<b>Needle Compatibility</b> BD pen needles are recommended.	<b>Needle Compatibility</b> BD pen needles are recommended.	<b>Needle Compatibility</b> NovoFine, NovoFine Autocover, NovoFine Plus, NovoTwist	<b>Needle Compatibility</b> NovoFine, NovoFine Autocover, NovoFine Plus, NovoTwist

## The Long and the Short of It

Each pen delivers a different brand and type (or types) of insulin. Some deliver rapid-acting (bolus, or mealtime) insulin. Others deliver long-acting (basal, or background) insulin. There are others that deliver a mixture of both in one injection. Giving yourself a dose of the wrong insulin can be dangerous, which is why disposable pens have different colored labels, cartridge holders, and/or dosing knobs.

## It's the Little Things

Many pens offer special features—spring-loaded mechanisms that require less force to deliver a dose of insulin, textures to differentiate them from other pens, and audible signals to let you know insulin has

been delivered. The reusable NovoPen Echo has a memory function that shows when the last dose was delivered and how much insulin was given at the time.

## Using a Pen

Insulin pen manufacturers recommend injecting at a 90-degree angle into your flesh. With short needles (4 or 5 millimeters), most adults do not need to pinch the skin. Very lean adults or kids, or those who use longer needles, may need to pinch the skin to ensure the insulin is deposited in the fat layer between the skin and muscle. Keep the pen needle in the skin for a count of 10 seconds after giving the dose to make sure the insulin is fully delivered.

**A fresh, sharp needle for each injection is best for comfort and cleanliness.**

 <p><b>Novo Nordisk NOVOPEN ECHO</b> Reusable</p> <p><b>Insulin</b> NovoLog PenFill Cartridges</p> <p><b>Dose Delivery</b> Half-unit increments, up to 30 units at a time</p> <p><b>Total Capacity</b> 300 units</p> <p><b>Details</b> Memory function shows units of last dose and hours since last injection. Pen is available in red with optional decorative skins.</p> <p><b>Needle Compatibility</b> NovoFine, NovoFine Autocover, NovoFine Plus, NovoTwist</p>	 <p><b>Owen Mumford AUTOPEN CLASSIC</b> Reusable</p> <p><b>Insulin</b> Humalog</p> <p><b>Dose Delivery</b> Comes in a one-unit increment version (with up to 21 units at a time) and a two-unit increment version (with up to 42 units at a time)</p> <p><b>Total Capacity</b> 300 units</p> <p><b>Details</b> Dosing button on the side for easier injecting and handling. Spring-loaded mechanism requires less force for dose delivery. Dose selector has audible clicks to ensure proper dosage. Pen is blue.</p> <p><b>Needle Compatibility</b> Works with most pen needles.</p>	 <p><b>Sanofi APIDRA SOLOSTAR</b> Disposable</p> <p><b>Insulin</b> Apidra</p> <p><b>Dose Delivery</b> One-unit increments, up to 80 units at a time</p> <p><b>Total Capacity</b> 300 units</p> <p><b>Details</b> Pen is blue.</p> <p><b>Needle Compatibility</b> BD, Owen Mumford, Ypsomed</p>	 <p><b>Sanofi LANTUS SOLOSTAR</b> Disposable</p> <p><b>Insulin</b> Lantus</p> <p><b>Dose Delivery</b> One-unit increments, up to 80 units at a time</p> <p><b>Total Capacity</b> 300 units</p> <p><b>Details</b> Pen is gray and has a texture to distinguish it from other pens.</p> <p><b>Needle Compatibility</b> BD Ultra-Fine</p>	 <p><b>Sanofi TOUJEO SOLOSTAR</b> Disposable</p> <p><b>Insulin</b> Toujeo</p> <p><b>Dose Delivery</b> One-unit increments, up to 80 units at a time</p> <p><b>Total Capacity</b> 300 units</p> <p><b>Details</b> Pen is off-white with a green label.</p> <p><b>Needle Compatibility</b> BD Ultra-Fine</p>
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# I ALWAYS KNOW WHEN HIS GLUCOSE LEVEL IS READY FOR A PARTY

IF YOUR LOVED ONE HAS DIABETES, NOW YOU CAN ALWAYS KNOW HIS GLUCOSE LEVEL WITH THE NEW DEXCOM G5™ MOBILE CONTINUOUS GLUCOSE MONITORING (CGM) SYSTEM. IT SENDS READINGS EVERY FIVE MINUTES\* — AND ALERTS WHEN NECESSARY — FROM A SMALL, BODY-WORN SENSOR TO YOUR SMART DEVICE.\*\* YOU WILL ALWAYS KNOW HIS LEVEL, SO HE CAN AVOID HIGHS AND LOWS.



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\*Dexcom G5 Mobile User Guide, 2015 \*\*For a list of compatible devices, visit [www.dexcom.com/compatibility](http://www.dexcom.com/compatibility)

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# Think Fast

Low blood glucose, also called hypoglycemia, can happen to anyone with diabetes who uses insulin or oral type 2 medications in either the sulfonylurea or meglitinide class of drugs. In addition to the meds you take, several other factors play a role in hypoglycemia. Physical activity, for instance, can cause blood glucose levels to drop even up to 24 hours after the exercise.

The symptoms, which include shakiness, dizziness, sweating, and weakness, can vary from person to person, but it's nearly always a scary feeling. When you have a low, you just want it to go away—fast. It's very important for people with diabetes who are at risk for hypoglycemia to always keep fast-acting glucose nearby.

Although candy and sugary drinks can do the job, specifically designed glucose products—tablets, gels, liquids, or powders—are preferable for several reasons. For one, they contain no fat (as candy bars do), which can slow

absorption of the glucose. Second, they contain precise amounts of fast-acting glucose, so you know exactly how much you're getting.

With these products, "you're less likely to overtreat because they're premeasured and don't taste as good as a chocolate bar," says Kellie Antinori-Lent, RN, CDE, a diabetes clinical nurse specialist at UPMC Shadyside in Pittsburgh.

When you feel or suspect a low, or if you have a blood glucose reading of less than 70 mg/dl, consume 15 to 20 grams of fast-acting carbohydrate. If your blood glucose is less than 40 mg/dl, eat or drink 30 to 40 grams of fast-acting carbohydrate.

Wait 15 minutes, then check your blood glucose. If it's still less than 70 mg/dl, take the same amount of glucose again. Adhering to this "15-Minute Rule" will help you avoid overtreating, which can lead to a high blood glucose level. That said, you might need to eat a meal or snack once your glucose returns to normal to prevent another low.

The exact amount of glucose needed to treat a low can vary from person to person, and sometimes even for the same person (say, when you have active insulin in your system versus when you don't). What's clear, though, is this: Anyone at risk for lows should know how to treat them—and always keep a source of glucose at hand.

## Take Note!

In addition to these products, many chain pharmacies, supermarkets, and big box stores carry their own brands of glucose products—such as Walmart does with its ReliOn products, listed here. Store-brand glucose contains the same amounts of fast-acting glucose and may be less expensive, although it might not taste the same.



## → GELS

### Dex4

(Perrigo)

**Carb:** 15 grams per pouch

**Dose:** One pouch

**Details:** One-dose disposable pouch. Comes in fruit punch flavor.

### Glutose 15

(Perrigo)

**Carb:** 15 grams per tube

**Dose:** One tube

**Details:** One-dose disposable tube. Available in grape and lemon flavors.



## → TABLETS

### Dex4

(Perrigo)

**Carb:** 4 grams per tablet

**Dose:** Four tablets for 16 grams of carb

**Details:** Available in a 10-tablet tube, 50-tablet bottle, and 100-tablet pouch.

Choose from citrus punch, grape, natural orange, orange, raspberry, tropical fruit, and assorted fruit flavors.



## → LIQUIDS

### Dex4

(Perrigo)

**Carb:** 15 grams per bottle

**Dose:** One bottle

**Details:** Resealable screw-top bottle. Comes in grape and berry twist flavors.

### ReliOn

**Glucose Drink**

(Walmart)

**Carb:** 15 grams per bottle

**Dose:** One bottle

**Details:** Resealable screw-top bottle. Comes in mixed berry flavor.

**Insta-Glucose**  
(Valeant Pharmaceuticals)  
**Carb:** 24 grams per tube  
**Dose:** One tube  
**Details:** Comes in a three-pack of squeezable (non-resealable) tubes. Available in cherry flavor.

**TruePlus Glucose Gel**  
(Trividia Health)  
**Carb:** 15 grams per pouch  
**Dose:** One pouch  
**Details:** Disposable pouch. Comes in fruit punch flavor.

**ReliOn**  
(Walmart)  
**Carb:** 15 grams per tube  
**Dose:** One tube  
**Details:** Twist-cap tube. Comes in fruit punch flavor.

**Transcend**  
(Transcend Foods)  
**Carb:** 15 grams per pouch  
**Dose:** One pouch  
**Details:** Comes in two three-packs, or packs of 12, 20, or 30 loose pouches. Available in strawberry flavor.

**Glucolift**  
(Jungell)  
**Carb:** 4 grams per tablet  
**Dose:** Four tablets for 16 grams of carb  
**Details:** Available in 40-tablet jars. Comes in wildberry and orange cream flavors. Reusable travel tube (sold separately) holds eight tablets.

**Optimum**  
(Magno-Humphries Labs)  
**Carb:** 4 grams per tablet  
**Dose:** Four tablets for 16 grams of carb  
**Details:** Available in a 50-tablet bottle. Comes in orange flavor.

**ReliOn**  
(Walmart)  
**Carb:** 4 grams per tablet  
**Dose:** Four tablets for 16 grams of carb  
**Details:** Available in a 10-tablet tube and 50-tablet bottle. Comes in grape, orange, fruit punch, raspberry, and tropical assorted fruit flavors.

**TruePlus Glucose Tablets**  
(Trividia Health)  
**Carb:** 4 grams per tablet  
**Dose:** Four tablets for 16 grams of carb  
**Details:** Available in a 50-tablet bottle and 10-tablet tube. Comes in grape, orange, raspberry, assorted fruit, and tropical fruit flavors.

**ReliOn Glucose Shot**  
(Walmart)  
**Carb:** 15 grams per bottle  
**Dose:** One bottle  
**Details:** Resealable screw-top bottle. Comes in orange and pomegranate flavors.

**TruePlus Glucose Shot**  
(Trividia Health)  
**Carb:** 15 grams per bottle  
**Dose:** One bottle  
**Details:** Resealable screw-top bottle. Comes in mixed berry, orange, and pomegranate flavors.

## → POWDER

**Elevate 15**  
(Diasan Corp.)  
**Carb:** 15 grams per packet  
**Dose:** One packet  
**Details:** Sold in boxes containing six individual packets of fine powder that can be eaten directly from the pouch or mixed with water. Comes in black cherry flavor.

## TOOL OF THE TRADE

If a person is unconscious or can't swallow, do not give them food or drink.

In such situations, a prescription **glucagon kit** can literally be a lifesaver. Both Eli Lilly and Novo Nordisk make rescue kits with glucagon, a hormone that raises blood glucose levels when injected under the skin. Kits contain a powdered form of glucagon and a syringe preloaded with sterile water or a diluting solution. The two substances are mixed and then injected into the person who needs it by someone else, such as a friend, family member, or coworker.

Glucagon kits can be expensive, so check the expiration date before you buy. "Make sure it won't expire for at least a year since it may have a large co-pay," says Kellie Antinori-Lent, RN, CDE, a diabetes clinical nurse specialist at UPMC Shadyside in Pittsburgh. Also make sure your helpers know where to find your kit and how to use it.



# Bonus Material

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Learn how length, width, and special features help determine the right pen needle for your needs.

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## ... Buy the Best Lancing Device

We cover four common finger-prick complaints—and highlight products that provide solutions.

» **Sneak Peek:** To ease pain from pricks, play with your lancing device's depth penetration settings.

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18 tools for people with dexterity problems, vision loss, and a fear of needles

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## CLICK IT

Find a list of insulins currently available in the United States at [diabetesforecast.org/insulin](http://diabetesforecast.org/insulin).

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†Diabetes Care 2014;37:1573-80. Doi:10.2337/dc13-2900

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# DIET DECISIONS

A FRANK LOOK AT CURRENT WEIGHT-LOSS PROGRAMS,  
FROM A DIABETES POINT OF VIEW

By Meghann Moore, RD, CDE, MPH

**M**ore than 1.1 billion adults worldwide are overweight, and 312 million of them are obese. The link between excess body weight and type 2 diabetes is well established, with nearly 50 percent of men and 70 percent of women obese at the onset of diabetes. Needless to say, preventing obesity is a high priority for the prevention of type 2 diabetes and other chronic diseases.

Although type 1 diabetes is an autoimmune disease unrelated to overweight and obesity, people with type 1 are at risk of developing other health problems if they are overweight. Being overweight or obese increases the risk for diabetes-related complications regardless of your type of diabetes. On the flip side, losing weight can cut your risk of an early death by up to 25 percent; it can slash your risk of dying from diabetes and heart disease by 28 percent. It's safe to say that you'll probably have more energy and feel better if you take off some of those extra pounds, too.

## Weight and Blood Glucose

Weight loss is a cornerstone of many a diabetes treatment plan. There is research



Neil Webb/The iSpot

to support the idea that blood glucose levels improve, evidenced by a reduction in A1C, when excess weight is shed and not regained. Other studies, however, demonstrate that weight loss is not associated with an improvement in blood glucose. Rather, those studies suggest that the improvement in blood glucose may have more to do with a decrease in total calorie intake.

Here's what we do know: Early on in prediabetes, when insulin resistance rather than insulin deficiency is the biggest issue, eating fewer calories and/or losing weight can improve blood glucose levels and may boost insulin sensitivity by close to 60 percent. Once type 2 diabetes has progressed from insulin resistance to the inability to make enough insulin, weight loss in conjunction with blood glucose-lowering medication can improve blood glucose control. There are some type 2 diabetes medications on the market, such as those in the GLP-1 receptor agonist class—exenatide extended release (Bydureon), liraglutide (Victoza), and dulaglutide (Trulicity), for instance—that help to control blood glucose and also result in weight loss. Once insulin deficiency sets in and insulin is needed, the primary goal often shifts from losing weight to preventing weight gain.

But there's another reason weight loss seems less attainable for people with type 2 diabetes. With high glucose levels, people burn more calories than normal because of increased protein turnover. Once blood glucose improves and protein breakdown decreases, energy expenditure drops back to normal. Fewer calories (in the form of glucose) are lost in the urine, too, which means less weight loss or, in some cases, weight regain.

This can understandably lead to feelings of anger, frustration, and hopelessness, all

additional barriers to weight loss. Some diabetes-related complications, such as foot ulcers and nerve pain, can also interfere with physical activity, which is recognized as a necessary part of maintaining weight loss.

## BODY FAT FACTS

**1.1+**  
**billion**

Number of adults in the world who are overweight

**312**  
**million**

Number of adults in the world who are obese

**9%**

Percentage of the world's population with diabetes

**50% Men**  
**70% Women**

Percentage of people who are obese at the onset of diabetes

### The Skinny on Research

The weight-loss industry offers many different programs, so one is sure to be a magic bullet, right? Not quite. Recently researchers reviewed the results of 45 studies of commercial weight-loss programs and compared the outcomes with a control group that received no weight-loss intervention or only some education or counseling. The study included Jenny Craig, Weight Watchers, Nutrisystem, Health Management Resources (HMR), Medifast, Optifast, SlimFast, Atkins, Ornish, and the Zone diet. After a year, the amount of weight lost was not associated with the diet type but rather with how well people followed whatever diet they were on.

It's no surprise that many popular weight-loss programs target specific plans at people with type 2 diabetes (a few of the plans have guidelines for people with type 1 diabetes, too). One thing to keep in mind about very-low-calorie medically supervised diets, such as Optifast, Medifast, and HMR, is that much of the research highlighting their success involved obese or very obese people and didn't always include those with diabetes. The results may not be the same for people with diabetes who are overweight rather than obese.

Another approach to weight loss with type 2 diabetes (but not type 1 diabetes) is bariatric surgery. Swedish researchers have determined that obese people with type 2 diabetes who receive bariatric surgery soon after diagnosis experience high rates of remission and health care cost savings compared with people with diabetes who don't get the surgery.

## Tried-and-True Approaches

While there are many different approaches to weight loss, what works the best over the long term is intensive behavioral modification, including:

- **Self-monitoring:** recording foods and amounts in a food journal or app
- **Stimulus control:** eliminating triggers, such as a bowl of candy within easy reach
- **Contingency management:** having a plan in place to give you access to healthy food—but not too much of it
- **Stress management:** avoiding high-stress situations and chronic stress, both of which can trigger comfort eating and make it more challenging for you to make healthy choices
- **Modeling:** hanging out with people who don't overeat and who make healthy choices in foods and beverages while also being physically active
- **Social support:** finding a source of encouragement, whether in person or online, for your weight-loss and maintenance efforts
- **Cognitive approaches:** practicing mindful eating and other therapeutic approaches known to help with binge eating

No matter how you choose to lose weight, take it one step at a time. And be patient: You did not gain your extra weight overnight, so don't expect to lose it that quickly either. You're more likely to drop pounds when you make a realistic, achievable action plan based on a few measurable goals. For example, instead of the general goal of eating better, get specific: Plan to pack a quarter cup of nuts as an alternative to vending-machine snacks. Or aim to call a friend for a comforting chat instead of emotionally eating.

The same goes for exercise: Don't just tell yourself you need to move your body more. Schedule a walk during lunch Monday through Friday. Another helpful strategy for weight loss includes visualizing how you'll feel once you reach your goal—where you will be, who you will be with, and what you will be doing.

Also consider any challenges you could face that will prevent you from sticking to

your action plan. What will you do when a colleague brings cupcakes into work? How will you alter your exercise plan when it rains? Come up with strategies to address these potential conflicts ahead of time so that when the time comes you're prepared.

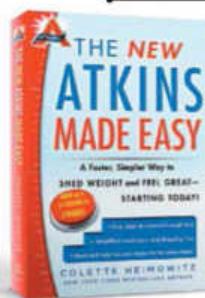
If you have a considerable amount of weight to lose, break your overall goal into smaller, more quickly reached chunks. Overwhelmed with the goal of dropping 80 pounds? Celebrate each time you lose an additional 10 pounds and reward yourself for getting there—buy yourself a new piece of clothing or get a massage (hint: food rewards are not the best idea if you're trying to lose weight). And remember: Losing weight is tough, no doubt, but even a 5 to 10 percent reduction from your starting weight is meaningful and can reduce your blood glucose and high blood pressure, too.

## DIET PROGRAM DETAILS

Not sure if a given eating plan is right for you? We dug through dozens of studies so you don't have to. Read on to get the skinny on popular weight-loss programs for people with diabetes.

### Atkins

A lower-carb eating plan that starts at 20 to 25 grams total daily carbohydrate (minus fiber) and tops out at 80 to 100 grams daily, the Atkins 20 program is designed for people with prediabetes and type 2.



**Results:** After four years, obese people with type 2 diabetes who got 20 percent of their total daily calories from carbohydrate sources (versus the typical 55 to 60 percent) lost an average of 7 percent of their starting weight and lowered their A1C from an average of 8 percent to 6.8 percent.

**Pros:** Free online tracking tools, meal planner, shopping list, and carb counter

**Cons:** May be difficult to sustain low-carb eating long term

**Packaged foods required?** Optional

**Resources:** [atkins.com](http://atkins.com), *The New Atkins Made Easy: A Faster, Simpler Way to Shed Weight and Feel Great—Starting Today* by Colette Heimowitz (Simon & Schuster, 2013)

Continued on page 96

# HELPS MANAGE YOUR DIABETES



Enterex® Diabetic is a delicious & healthy shake that can be used as part of your nutritional plan to help control your blood sugar levels or as part of your weight loss program.

Enterex® Diabetic is sweet yet contains **NO ADDED SUGAR**.

# Enterex® Diabetic



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**Save \$1.00 instantly when you buy one six-pack of Enterex® Diabetic**

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[www.enterexdiabetic.com](http://www.enterexdiabetic.com)

meijer



Winn-Dixie



Walmart

AVAILABLE AT

Continued from page 94

## The Diabetes Breakthrough

Following this at-home guide, which is based on the Joslin Diabetes Center's 12-week Why Wait program, participants eat do-it-yourself meal replacements and follow a 1,200- to 1,800-calorie daily meal plan.

**Results:** Participants with type 2 diabetes had a 50 to 60 percent decrease in diabetes medications and an average 6.4 percent decrease in weight after five years. A1C decreased from an average of 7.26 to 6.37 percent at the 12-week mark.

**Pros:** Emphasizes a protein-rich eating plan and strength-training exercises and includes tips on building fitness and overcoming psychological barriers

**Cons:** With meal replacement shakes twice a day—and only six snacks and 14 dinner menus to choose from—this could get boring.

**Packaged foods required?** No

**Resource:** *The Diabetes Breakthrough* by Osama Hamdy, MD, PhD, and Sheri Colberg, PhD (Harlequin, 2014)

## Dr. Neal Barnard's Program for Reversing Diabetes

The plan features a low-fat, plant-based eating plan for type 2 diabetes, with about 10 percent of calories from fat, 15 percent from protein, and 75 percent from carbohydrate sources such as vegetables, fruits, grains, and legumes.

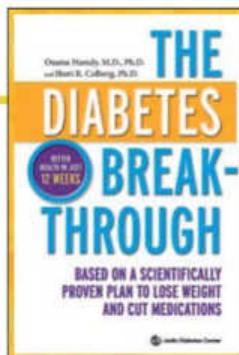
**Results:** 43 percent of people reduced diabetes meds, versus 26 percent on a typical eating plan. People following the plan also lowered their A1C by 1.23 points (those on the traditional eating plan dropped theirs by only 0.38 points), lost 14.3 pounds ( $7\frac{1}{2}$  pounds more than those on a typical eating plan), and saw a significant decrease in LDL ("bad") cholesterol.

**Pros:** Portion sizes, calories, and carbohydrate grams are unrestricted.

**Cons:** It may be unappealing and challenging for some to adopt this vegan (no animal products) plan.

**Packaged foods required?** No

**Resource:** *Dr. Neal Barnard's Program for Reversing Diabetes: The Scientifically Proven System for Reversing Diabetes Without Drugs* by Neal D. Barnard, MD (Rodale, 2008)



## HMR Weight Management

(Health Management Resources)

HMR is a medically supervised weight-loss program that includes three or more shakes, two or more main dishes, and five or more servings of fruits and vegetables per day, plus daily exercise and healthy lifestyle skills.

**Results:** After 12 weeks, obese people with type 2 diabetes had lost 14 percent of their starting weight. Overall, participants decreased oral diabetes medications by up to 57 percent.

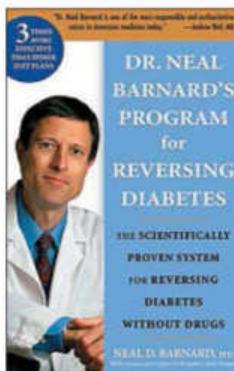
**Pros:** The methodology includes response to hunger: If you feel hungry, eat another shake, main dish, or more fruits and veggies. The plan includes weekly phone coaching sessions.

**Cons:** Heavy reliance on shakes and limited packaged meal choices could get old fast.

**Packaged foods required?** Yes

**Cost:** About \$10 per day initially, then \$16 per day

**Resource:** [healthysolutions.com](http://healthysolutions.com)



## Jenny Craig for Type 2

The program features one-on-one diet and exercise counseling with prepackaged foods for 1,200 to 2,300 total daily calories. It's aimed at an average weekly weight loss of 1 to 2 pounds, or 1 percent of current weight.

**Results:** Participants with type 2 diabetes lost an average of about 10 percent of their starting weight by the one-year mark, but after two years the average weight loss was down to about 7 percent, with the average A1C lowered to 6.9 percent. Fasting glucose and triglyceride levels were also reduced.

**Pros:** Teaches behavior modification tips and is appropriate for type 2s on insulin who are followed closely by their primary care provider

**Cons:** Not available for people who require special diets (gluten free, vegan, kosher, halal) or have celiac disease

**Packaged foods required?** Yes

**Cost:** \$15 to \$23 per day for food on top of a \$99 enrollment fee and \$19 monthly program fee

**Resource:** [jennycraig.com](http://jennycraig.com)

## Medifast

The program specifies four to five Medifast meals, one to two “lean and green” self-prepared meals, and healthy snacks to achieve 800 to 1,600 total calories daily.

**Results:** 40 percent of people with type 2 diabetes using Medifast lost at least 5 percent of their starting weight by week 34 versus 12 percent for people who chose their own foods based on healthful diet recommendations.

**Pros:** Medifast recognizes the needs of people with type 1 and type 2 diabetes. Health coaching is available through the Take Shape for Life program.

**Cons:** Meal replacements may get boring over time.

**Packaged foods required?** Yes

**Cost:** First order is \$10 to \$13 per day. After that, it costs \$14 to \$18 daily.

**Resource:** [medifast1.com](http://medifast1.com)



## Mediterranean Diet

The many versions of this plant-based eating plan stress that meals are best when shared with others and savoried. Daily exercise is encouraged.

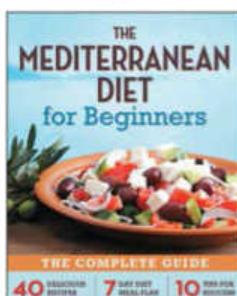
**Results:** After a year, people with type 2 diabetes significantly improved their fasting blood glucose and reduced their A1Cs by an average of 1.2 percentage points. Weight loss, however, wasn’t consistent among the studies.

**Pros:** There’s plenty of variety: The emphasis is on in-season fruits, vegetables (especially dark leafy greens), legumes, nuts, minimally processed whole grains, olive oil, herbs, spices, and fatty fish twice a week.

**Cons:** Research has been done primarily in Mediterranean countries, so it’s unknown whether the results are generalizable to other populations.

**Packaged foods required?** No

**Resources:** Multiple books, including *The Mediterranean Diet for Beginners: The Complete Guide* (Rockridge Press, 2013)



## Nutrisystem D

This meal delivery program, which includes four to five Nutrisystem meals or snacks daily supplemented with fresh fruits, vegetables, dairy, and nuts, aims for 1,200 to 1,500 total daily calories.

**Results:** After three months, 80 percent of program participants with type 2 diabetes had lost about 5 percent of their starting weight, an 18-pound average weight loss. The average A1C dropped by 0.7 percentage points, and waist circumference and total cholesterol were reduced as well.

**Pros:** Registered dietitians and certified diabetes educators are available by phone or chat line. Track your progress, receive activity recommendations, and browse recipes online or through Nutrisystem’s NuMi app, which syncs with many fitness trackers.

**Cons:** Unknown whether weight loss continues after one year

**Packaged foods required?** Yes

**Cost:** \$10 to \$12 per day

**Resource:** [nutrisystem.com](http://nutrisystem.com)

## Optifast

During this 26-week, medically supervised program—which features meal replacements, education, counseling, and support—participants aim for only 800 calories daily.

**Results:** Overweight people with type 2 diabetes had decreases in weight, blood glucose, blood pressure, and total cholesterol levels after six months.

**Pros:** Optifast is appropriate for people with type 2 and people with type 1 if closely monitored by a diabetes specialist (the plan includes recommendations for basal and bolus insulin).

**Cons:** At the one-year follow-up, participants had regained most of the weight they lost, and their A1C levels returned to the starting value.

**Packaged foods required?** Yes

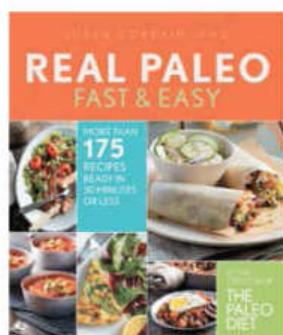
**Cost:** Varies by city, clinic, and weight-loss goal

**Resource:** [optifast.com](http://optifast.com)

**A 2- to 4-pound rate of weight loss per month on an eating plan means you've probably achieved a sustainable change in habits that may help you avoid regaining the weight.**

### Paleolithic (Paleo) Diet

This program replaces two daily meals with a SlimFast shake, smoothie, or bar, and encourages a 500-calorie healthy meal and three 100-calorie snacks.



**Results:** In a three-month comparison of Paleo eating, the Plate Method, and glycemic index-based eating, type 2s following the Paleo plan had lower average A1Cs, triglycerides, diastolic (bottom number) blood pressure, weight, body mass index, and waist circumference, as well as higher average HDL ("good") cholesterol.

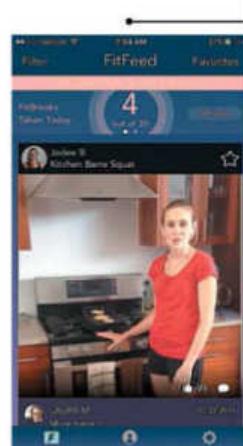
**Pros:** Availability of various books and online guidance, support, and recipes for this eating approach

**Cons:** Data on weight loss, A1C, and other benefits after three months are unknown. Study sample size was small.

**Packaged foods required?** No

**Resource:** [thepaleodiet.com](http://thepaleodiet.com)

(among many others)



### SlimFast

This program replaces two daily meals with a SlimFast shake, smoothie, or bar, and encourages a 500-calorie healthy meal and three 100-calorie snacks.

**Results:** After 12 weeks, obese people with type 2 diabetes using SlimFast meal replacements lost between 6.4 and 6.7 percent of their starting weight, while those following an exchange diet plan lost only 4.9 percent. SlimFast users also experienced significant reductions in total and LDL cholesterol, which were not seen in the exchange diet group.

**Pros:** A do-it-yourself-plan, SlimFast is less expensive than other meal replacement programs and provides healthy recipes.

**Cons:** Meal replacement and snack choices are very limited. There's minimal professional guidance and support.

**Packaged foods required?** Yes

**Cost:** About \$7 a day for SlimFast meal replacements

**Resources:** [slimfast.com](http://slimfast.com)

### Weight Watchers

The program kicks off with a two-week introduction without tracking food points, then transitions to the PointsPlus program, which requires participants to track all foods based on a point system that takes into account calories as well as nutrients.

**Results:** After a year, people (without diabetes) on the program lost two times as much weight as those receiving only weight-loss advice.

**Pros:** Weekly support meetings include weigh-ins, group discussions, and behavioral counseling. The program emphasizes nonstarchy vegetables, lean protein, and whole grains, but no foods are off limits.

**Cons:** The program may be cost prohibitive if you need to lose a lot and wish to remain in the program until reaching your goal weight. The group format may not appeal to all.

**Packaged foods required?** Optional

**Cost:** Varies by region; the national average is less than \$10 per week for the enrollment fee and weekly meetings.

**Resources:** [weightwatchers.com](http://weightwatchers.com)



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YOUR

# Food

Featured Recipes | Double Up | By the Plate

## Relax & Refresh

**GIVE YOUR TASTE BUDS** a spa treatment with a focus on fresh, minimally processed foods, including vegetables and nutrient-rich nuts and seeds. These calorie-smart recipes—inspired by Food Editor Robyn Webb's visit to health and wellness retreat El Conquistador Waldorf Astoria Resort in Fajardo, Puerto Rico—are packed with luscious flavor, so they're fully satisfying.



### RECIPES BY

Robyn Webb, MS, LN, and Michelle Rivera

### PHOTOGRAPHS BY

Kyle Dreier

### STYLING BY

Whitney Kemp



## Strip Steak With Smothered Onions

SERVES 6

SERVING SIZE: 2 oz steak, about ½ cup onions

PREPARATION TIME: 5 minutes

COOKING TIME: 25 minutes

- 1 lb lean New York Strip steak (about ¾-inch thick)
- ½ tsp kosher salt
- ¼ tsp freshly ground black pepper
- 1 Tbsp olive oil, divided
- 2 large sweet onions, peeled and halved, thinly sliced
- ¼ cup water
- ½ tsp dried thyme
- ½ tsp brown sugar

1. Sprinkle the steak with the salt and pepper.

2. Heat ½ Tbsp of the oil in a large cast-iron skillet over high heat. Add the steak and sear for about 3 minutes. Turn the steak over, reduce the heat to medium, and cook for 4 to 6 minutes, or longer as desired for doneness. Remove the steak from the pan and keep it warm.

3. Add the remaining oil to the pan. Add the onions and sauté over medium heat for 5 minutes. Add the water, thyme, and brown sugar, cover the pan, and simmer over medium-low heat for 10 minutes, until the onions are very soft.

4. Slice the steak. Serve the slices covered with the onions.

**Per Serving:** Calories 170, Total Fat 6 g

(Sat. Fat 1.9 g), Cholesterol 50 mg,

Sodium 200 mg, Potassium 355 mg,

**Total Carbohydrate** 9 g (Fiber 1 g, Sugars 6 g),

Protein 18 g, Phosphorus 195 mg

**Choices:** Nonstarchy Vegetable 2,

Lean Protein 2, Fat 0.5

## Creamy Mushroom Soup

SERVES 10

SERVING SIZE:  $\frac{2}{3}$  cup

PREPARATION TIME: 20 minutes

COOKING TIME: 35 minutes

- 1 oz mixed dried mushrooms
- 2 cups hot water
- 2 Tbsp olive oil
- 1 medium onion, chopped
- 1 medium shallot, minced
- 2 scallions, minced
- 1 clove garlic, finely minced
- 1 celery stalk, diced
- 8 cups (about 1½ lb) white or cremini mushrooms, stemmed, cleaned, and sliced
- ¼ tsp red pepper flakes, or more to taste
- ¼ tsp kosher salt
- ¼ tsp freshly ground black pepper
- 2 Tbsp all-purpose flour
- 3 cups reduced-sodium, low-fat chicken broth
- ½ cup dry sherry
- ½ cup nonfat sour cream
- 2 Tbsp finely minced fresh chives

1. Add the dried mushrooms to a heatproof bowl. Pour the hot water over the mushrooms and set aside.
2. Heat the olive oil in a large pot over medium heat. Add the onion and shallot and sauté for 5 to 6 minutes, until soft. Add the scallions and garlic and sauté for 1 to 2 minutes. Add the celery and sauté for 2 minutes. Add the fresh mushrooms and sauté for about 5 minutes, just until the mushrooms are about to give up their liquid. Add the red pepper, salt, and black pepper and sauté for 1 minute. Add the flour and stir, completely coating the vegetables.
3. Pour in the chicken broth. Drain the dried mushrooms, but reserve the liquid



(but don't save any sediment at the bottom of the bowl). Chop the reconstituted mushrooms coarsely and add them and the reserved liquid to the pot. Add the sherry. Bring to lightly boiling. Lower the heat to simmer, cover, and cook for 20 minutes.

4. Using an immersion blender, blend the soup until smooth. Or add the soup, in batches if necessary, to a blender or food processor and purée until smooth. Return the soup to the pot and fold in the sour cream. Ladle the soup into bowls and top with the minced chives.

### Per Serving:

**Calories** 80,

**Total Fat** 3 g

(Sat. Fat 0.5 g),

Cholesterol 0 mg,

Sodium 240 mg,

Potassium 440 mg,

### Total Carbohydrate

11 g (Fiber 1 g,

Sugars 3 g),

Protein 4 g,

Phosphorus 115 mg

### Choices:

Carbohydrate 1,  
Fat 0.5

## Raw Fig Bars

SERVES 16

SERVING SIZE: 1 bar

PREPARATION TIME: 25 minutes

CHILLING TIME: 2 hours

### Dough

**2** cups whole almonds or  
**2** cups ground almond meal  
**1/4** cup almond butter  
**1/4** cup almond milk, unsweetened and unflavored  
**1/4** cup pure maple syrup  
**2** Tbsp chia seeds  
**1 1/4** tsp ground cinnamon  
**1/2** tsp pure vanilla extract  
**1/4** tsp sea salt  
Wax paper

### Filling

**1 1/2** cups dried figs  
**3** cups boiling water  
**1 1/2** tsp fresh lemon juice  
**1/2** tsp pure vanilla extract

**1.** If you are able to find already blanched (skinless) almonds, skip this first step and proceed to step 2. If you're using whole almonds, fill a 3-quart pot two-thirds full with water and bring to boiling. Add the almonds to the boiling water, turn off the heat, and let the almonds stand in the water for 2 minutes. Drain. Place a clean towel on a work surface. Add the almonds to the towel. Roll up the towel and gently knead the almonds. This will loosen the almond skins. Remove all of the skins and discard. Pat dry the blanched almonds.

**2.** If you're using almond meal, skip this step and proceed to step 3. If you're using whole, blanched almonds, add the almonds to a blender or food processor. Grind for 30 to 40 seconds, until the texture is like meal. It should still be a little coarse. Measure 2 cups of almond meal.

**3.** For the dough, place the almond meal, almond butter, almond milk, maple syrup, chia seeds, cinnamon, vanilla, and salt in a food processor and process until it forms a sticky dough.

**4.** Place the dough between two pieces of wax paper and roll it out with a rolling pin to a rectangular shape,  $\frac{1}{4}$  inch thick. Keeping the dough sealed in the wax paper, place the dough on a baking sheet and let it rest in the refrigerator for at least 1 hour.

**5.** Meanwhile, for the filling, place the figs in a medium-sized heat-proof bowl and pour in the 3 cups of boiling water. Let the figs soak for 30 minutes. Drain the figs and place them in a food processor with the lemon juice and vanilla and process until the mixture is smooth. Spread the filling mixture on half of the dough. Fold the other half of the dough over the mixture and press the edges together to seal the filling. Cover with the wax paper.

**6.** Refrigerate the filled dough for 1 hour. Peel back the top layer of wax paper. Cut the filled dough into 8 even logs and then cut again to make 16 bars. Place the bars in an airtight container, separating layers of bars with wax paper, and store in the refrigerator for up to 3 days for best freshness.

### Per Serving:

**Calories** 160, **Total**

**Fat** 10 g (Sat. Fat 0.8 g), Cholesterol 0 mg, Sodium 45 mg, Potassium 245 mg,

### Total Carbohydrate

17 g (Fiber 4 g, Sugars 11 g), Protein 5 g, Phosphorus 110 mg

### Choices:

Carbohydrate 1, Fat 2

Recipe courtesy of Michelle Rivera, executive pastry chef, El Conquistador Waldorf Astoria, Fajardo, Puerto Rico



# Takeout at Home

With one shopping list, make two delicious Asian-inspired recipes that each serve two. These dishes are full of flavor, but have much less fat and sodium than their restaurant counterparts. —*Robyn Webb, MS, LN*



## Shopping List

### FRESH PRODUCE

- Cilantro
- Garlic, 1 clove
- Ginger root
- Mango, small
- Red and yellow bell peppers, 1 each, small
- Snow peas

### MEAT, POULTRY, SEAFOOD

- Boneless, skinless chicken breasts,  $\frac{1}{2}$  lb

### WHOLE GRAINS

- Brown rice

### OTHER

- Rice papers, medium (8.5 inches in diameter)

### CONDIMENTS

- Lower-sodium soy sauce
- Hoisin sauce

### PANTRY STAPLES

- Black pepper
- Kosher salt
- Olive, sesame, and vegetable oils
- Sesame seeds

### 1 Rice Paper Roll-Ups

SERVES 2

SERVING SIZE: 2 roll-ups

PREPARATION TIME: 30 minutes

COOKING TIME: 10 minutes

**1/2 lb boneless, skinless chicken breasts (after cooking, place half in a tightly sealed container and refrigerate for the next recipe)**

**1/4 tsp kosher salt**

**1/4 tsp freshly ground black pepper**

**1/2 Tbsp olive oil**

**4 medium (8.5-inch-diameter) rice papers**

#### Filling

**1/4 cup coarsely chopped fresh cilantro**

**1 small red bell pepper, thinly sliced\***

**1 small yellow bell pepper, thinly sliced\***

**1/2 cup trimmed snow peas, julienned\***

**1 small mango, peeled and sliced into long, thin strips\***

**1 Tbsp toasted sesame seeds**  
**1 Tbsp bottled hoisin sauce**

**1.** Preheat the oven broiler to high. Line a broiler pan with foil. Set the oven rack 6 inches from the heat source. Sprinkle the chicken on both sides with the salt and pepper. Add the chicken to the broiler pan. Drizzle with the olive oil. Broil the chicken for 5 to 6 minutes per side. Remove the chicken from the oven and let cool.

**2.** When the chicken is cool enough to handle, thinly slice it. Place half of the chicken in an airtight container and refrigerate for the next recipe.

**3.** Fill a large, shallow bowl with warm water. Add one rice paper disk to the bowl and let soak for 20 seconds. Remove the rice paper from the bowl and transfer it to a flat

\* Place half in a tightly sealed container and refrigerate for the next recipe.



working surface; pat dry with paper towels. Make a 3-inch row of filling ingredients near the bottom third of the rice paper; leave a 1-inch margin clear of filling. Sprinkle the filling with some of the sesame seeds and drizzle some hoisin sauce on top. Carefully fold the bottom end of the paper over the filling. Fold over each side of the rice paper and then roll it up like a burrito. Repeat with remaining ingredients. Cut each roll-up in half on a bias to serve.

**Note:** Do not soak the rice papers all at once. Make one roll at a time. For best results, fill and roll rice papers immediately after soaking them in water.

**Per Serving:** Calories 250,  
**Total Fat** 6 g (Sat. Fat 1.1 g),  
Cholesterol 35 mg, Sodium  
375 mg, Potassium 305 mg, **Total  
Carbohydrate** 33 g (Fiber 3 g, Sugars  
8 g), Protein 15 g, Phosphorus 305 mg  
**Choices:** Starch 1.5, Fruit 0.5,  
Nonstarchy Vegetable 1

## 2 Mango Chicken Stir-Fry

SERVES 2

SERVING SIZE: 1 cup stir-fry, ½ cup brown rice

PREPARATION TIME: 10 minutes

COOKING TIME: 5 minutes

- 1 tsp vegetable oil
- 1 garlic clove, minced
- 1 Tbsp peeled, grated ginger
- Reserved bell peppers (1 cup slices) and snow peas (¼ cup julienned)\*
- 1 Tbsp water
- Reserved mango (1 cup slices)\*
- Reserved chicken\*
- 1 Tbsp hoisin sauce
- 2 tsp lower-sodium soy sauce
- ½ tsp sesame oil
- 1 cup cooked brown rice

\* From Rice Paper Roll-Ups recipe

1. Heat the vegetable oil in a large wok or heavy skillet over medium-high heat. Add the garlic and ginger and stir-fry for 30 seconds. Lower the heat to medium.

2. Add the reserved bell peppers and snow peas. Stir-fry for 1 minute. Add the water, cover, and steam for 2 minutes. Add the reserved mango and cooked chicken and stir-fry for 1 minute.

3. Combine the hoisin and soy sauces with the sesame oil. Drizzle the sauce over the chicken and vegetables. Serve the stir-fry over the brown rice.

**Per Serving:** Calories 260,

**Total Fat** 6 g (Sat. Fat 0.9 g),

Cholesterol 35 mg, Sodium

350 mg, Potassium 330 mg, **Total  
Carbohydrate** 35 g (Fiber 3 g, Sugars

9 g), Protein 16 g, Phosphorus 330 mg

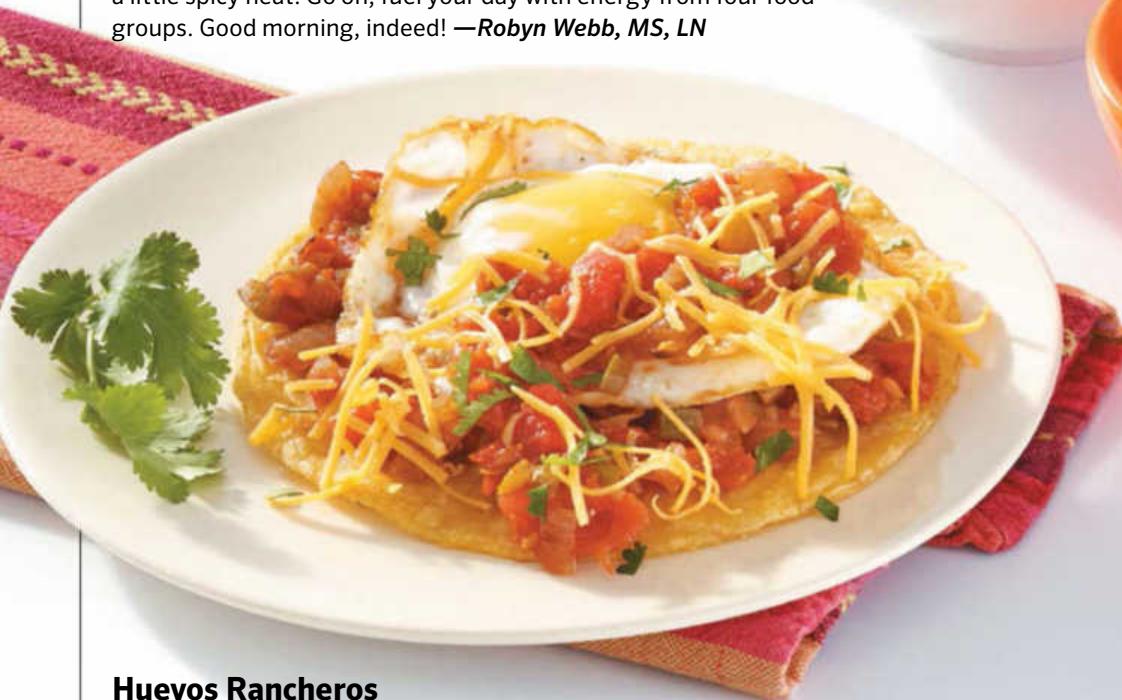
**Choices:** Starch 1.5, Fruit 0.5,

Nonstarchy Vegetable 1, Lean Protein 2



## Fresh Start

This easy breakfast main dish will wake up your taste buds with a little spicy heat. Go on, fuel your day with energy from four food groups. Good morning, indeed! —*Robyn Webb, MS, LN*



### Huevos Rancheros

**SERVES 4**

**SERVING SIZE:** 1 tortilla, 1 egg,  
about  $\frac{1}{4}$  cup sauce

**PREPARATION TIME:** 10 minutes

**COOKING TIME:** 20 minutes

- 1½ Tbsp olive oil, divided
- 1 small onion, minced
- 2 garlic cloves, minced
- ½ small jalapeño pepper, seeded and minced (about 1 Tbsp)
- 1 (28-oz) can whole tomatoes, drained
- ¼ tsp kosher salt
- ¼ tsp freshly ground black pepper
- ¼ tsp cayenne pepper (optional)
- 4 (6-inch-diameter) corn tortillas
- 4 large eggs
- 1½ Tbsp grated cheddar cheese
- 1 Tbsp minced fresh cilantro

1. In a large skillet, heat ½ Tbsp of the olive oil over medium heat. Add the onion and sauté for 3 to 4 minutes. Add the garlic and jalapeño pepper and sauté for 1 minute.
2. Heat the oven to 350 F. Add the tomatoes to a large bowl and crush them with your



### The Meal

**Calories** 390  
**Carbohydrate** 52 g

### The Sides

#### Fruit

1 cup cantaloupe and honeydew chunks sprinkled with 1 tsp fresh lime juice, garnished with a mint sprig  
Calories 60  
Carbohydrate 14 g

#### Dairy

1 cup plain nonfat yogurt with ¼ tsp ground cinnamon and ½ tsp honey  
Calories 110  
Carbohydrate 18 g

**Choices:** Fat-Free Milk 1.5

### Per Serving

#### Huevos Rancheros

**Calories** 220, **Total Fat** 12 g (Sat. Fat 2.9 g), Cholesterol 190 mg, Sodium 240 mg, Potassium 425 mg,

#### Total Carbohydrate

20 g (Fiber 3 g, Sugars 5 g), Protein 10 g, Phosphorus 240 mg

**Choices:** Starch 1, Nonstarchy Vegetable 1, Medium-Fat Protein 1, Fat 1



*Lexi B.*

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News About the American Diabetes Association

## Award Winner

### Award

#### EACH YEAR, THE

American Diabetes Association issues an award to the person who makes the greatest contribution to building the Association's legal advocacy volunteer networks of attorneys, health care professionals, and school advocates.



Cynthia Muñoz, PhD, MPH

The networks expand the ADA's capacity in educating about, advocating for, and negotiating on behalf of people facing discrimination because of their diabetes.

The recipient of the 2015 Steve Bieringer "Keep on Trucking" Award is Cynthia Muñoz, PhD, MPH, a pediatric psychologist and dedicated Safe at School advocate. In 2015, Muñoz conducted training on diabetes for all Los Angeles Unified School District school nurses—a first and important step in ensuring that one of the nation's largest public school systems is equipped to care for students with diabetes. Muñoz is an assistant professor of clinical pediatrics at the University of Southern California Keck School of Medicine and a pediatric psychologist at Children's Hospital Los Angeles.

An ADA advocacy training event in Los Angeles sparked her journey into advocacy leadership. It soon led to her attending local advocacy meetings, then chairing the Los Angeles Safe at School committee, serving on the community leadership board, and chairing the Los Angeles legal advocacy committee. "I've dedicated my career as a pediatric psychologist to promoting optimal quality of life for children and families who live with this disease," Muñoz says. "My motivation is my family. Several of my family members live—or have lived—with diabetes. It's their struggle, along with my own personal risk factor, that fuels my fight." ▲

Click

Read more about the award's namesake antidiscrimination advocate, Steve Bieringer, at [diabetes.org/stevebieringeraward](http://diabetes.org/stevebieringeraward).

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**Rebecca Hasson, PhD****Occupation**

Director, Childhood Disparities Research Laboratory at the University of Michigan

**Focus**

Insulin Resistance/Prediabetes

**ADA Research Funding**

Junior Faculty

# Fight or Flight

Could the body's natural reaction to stress play a role in type 2 diabetes risk?

BY ANDREW CURRY

**Research**

**TYPE 2 DIABETES** is a modern epidemic, but an enduring puzzle is why it's spreading faster in some groups than in others. In the United States, 1 in 2 African Americans and Latinos will develop type 2 diabetes in their lifetimes; the risk for whites is 1 in 3.

Researchers once thought genes might account for the dramatic differences. Studies trying to tease out the reasons for disparities in type 2 diabetes risk have also examined factors such as physical activity, nutrition, and family history of diabetes.

But there's increasing evidence that the environment we live in plays a bigger role than the genes we're born with. The everyday

stresses people face, such as poverty and discrimination—factors that some people live with more than others—may be taking a physical toll. "There's substantial evidence to demonstrate the environment we live in has direct impacts on our health," says exercise physiologist Rebecca Hasson, PhD, director of the Childhood Disparities Research Laboratory at the University of Michigan.

One reason is a hormone called cortisol. Cortisol puts gas in the body's tank: It tells the body to increase blood glucose, directs cells to resist insulin's signals to absorb and store blood glucose in favor of keeping it available for muscles to burn, and prompts cravings for

**“ IF THERE ARE ETHNIC DIFFERENCES IN THE STRESS PATHWAYS, THAT COULD HELP GUIDE OUR INTERVENTION. WE’D HAVE TO START ASKING OURSELVES HOW WE CAN REDUCE STRESS IN THEIR LIVES.**

—REBECCA HASSON, PHD

high-calorie foods. It's released in times of stress to help supply the body with as much energy as possible, as part of the "fight or flight" response to immediate threats. "Cortisol is a biomarker of stress," Hasson says.

That's all good, if you're being attacked by a lion and need energy to escape. But other things can trigger cortisol, too. "Those energy substrates are mobilized so you can run away," Hasson says. "But if you don't, or can't run away—you're late for school, someone's pointing a gun at you, you can't pay your bills—you're always in this high-alert situation, whether or not you're conscious of it."

When cortisol levels are consistently high but there's no physical activity to buffer the effects of chronic stress, the consequences may contribute to type 2 diabetes. Higher cortisol results in higher insulin resistance, for example, forcing the pancreas to produce more insulin to get a response. With ongoing insulin resistance, the insulin-producing beta cells wear out, causing type 2 diabetes.

If we know chronic stress makes people sick, is it possible blacks and Latinos are sicker than whites because they're more stressed? They're more likely to be poor or live in poor neighborhoods, so they're more likely to be exposed to the chronic stressors of poverty—and to cortisol, with all of its negative effects. Exposure to discrimination, too, can be a stressful experience. "Overall, ethnic minorities have much higher cortisol levels and exposure than whites," Hasson says.

With the help of a grant from the American Diabetes Association and funding from the Prince Hall Shriners, Hasson is working with 150 obese children between ages 14 and 18 to measure the links between stress, race, and type 2 diabetes risk directly. The teenage years, Hasson says, are a "perfect biological and social storm" where school, family, and neighborhood stresses pile on to already raging hormones.

Part of the study involves gathering information on family income, diet, family life, and any racial discrimination participants might have experienced, all to get a sense of reasons they might feel stressed.

Because the stress levels teens self-report aren't always reliable, Hasson also measures cortisol as a reference, asking participants to spit into a test tube five times a day and measuring cortisol levels in saliva. "You can't rely on somebody's perception of stress in their life. Kids exposed to a lot of stress underreport," she says.

Overall, Hasson has found that the African American and Latino children in the study have higher cortisol levels. By following them over time, she hopes to find out if their cortisol levels and other measures of stress are connected to higher rates of type 2 diabetes. "If there are ethnic differences in the stress pathways, that could help guide our intervention," Hasson says. "We'd have to start asking ourselves how we can reduce stress in their lives." ▲

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# Reflections



Ethan (left)  
and Matthew  
Halman

## All in the Family

**M**y 17-year-old brother Ethan sat upright on a workout bench in the basement of our suburban New Jersey home. He faced me with an open, albeit slightly nervous, expression. My iPad rested on a folding table between us to record our interview—part of my undergraduate paper on illness experiences.

Ethan had a bottle of water next to him, and as he took a small sip I was brought back to a moment five years earlier. It was the same time of night, around 8:30, and I'd finished my homework early after my JV soccer practice. Sixteen years old, I chased my 11-year-old brother around the first floor of our house. Ethan was skinny, too skinny, but we didn't realize it at the time. I wanted to continue the game, but Ethan begged to stop for a drink of water, chugging cup after cup as I waited on.

Two months later, Ethan was diagnosed with type 1 diabetes, and daily life in the Halman household forever took a new form.

I remember his diagnosis vividly. Ask him, though, and he won't recollect the year, let alone the month or day. From counting carbs to checking blood glucose, diabetes care during those early years was much more taxing on me and my parents than on Ethan. Though he endured the shots, we lived with the knowledge that his blood glucose abnormalities could have drastic short-term effects and unnerving long-term risks.

And we lived through nights worried about lows. My parents took the form of superheroes to ensure that his blood glucose was regulated while he slept. Flashlights in hand, they tiptoed into our shared bedroom to uncurl a finger from Ethan's sleeping body

(he could sleep through a fire alarm, and has) and prick his finger. A high reading, and they'd deliver insulin. A too-low number, and they'd wake him to gulp down a juice box. Sometimes it was done as a team. Other times it was done in shifts. Most times it woke me—the world's lightest sleeper.

But when I asked him about it during our interview, the nocturnal ritual stood out no further in Ethan's 17-year-old mind than did carb counting. Though there were many nights when he was woken to stabilize his glucose, the initial fear that came with every "bad" number didn't register on his consciousness.

Today, Ethan is much more attentive to risks associated with having diabetes. However, these risks have never caused him to lose hope. I will forever be impressed with how nonchalantly Ethan accepts his illness. I can only hope that if I were in his shoes I would have the capacity to not scream, "Why me?" Ethan, without any questions asked, knows that this illness is just another part of his life. And as long as it's there, he'll have support from his family to help manage it—whether or not he realizes just how deeply we share his illness experience.

**MATTHEW HALMAN** is a graduate student at the London School of Economics and Political Science, where he's pursuing a master's degree in conflict studies in the Department of Government.

### We welcome your Reflections submissions:



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